Final Engineering Design Report

Aladdin Plating Site Remediation Project
Tacoma, Washington

for
Washington State Department of Ecology

August 26, 2015

GeoEngineers
Earth Science + Technology

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File No. 0504-095-01

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1.0 INTRODUCTION

This Engineering Design Report (EDR) has been prepared for a planned remedial action for the Aladdin Plating Site (Site) at 1657 Center Street (Property) in Tacoma, Washington (Figure 1). The Property is a corner lot northeast of the Center Street and South Alaska Street intersection. The Site measures approximately 100 feet long by 30 feet wide. There are no structures currently on the parcel (Figure 2). The remedial action is being conducted by the Washington State Department of Ecology (Ecology) to address contamination resulting from releases from past metal plating operations at the Site. The Aladdin Plating Facility/Site Identification Number (ID) is 1277 and Cleanup Site ID is 3257.

This EDR was prepared to meet the requirements of the Washington State Model Toxics Control Act (MTCA), Chapter 173-340, of the Washington Administrative Code (WAC). The remedial action is being conducted to implement the preferred cleanup alternative specified in the Ecology-approved Cleanup Action Plan (CAP) (GeoEngineers, 2014a) prepared for the Site. The preferred remedial alternative includes excavation of soil with contaminant concentrations greater than the Site cleanup levels. The remedial action is anticipated to occur over a period of 30 to 60 days beginning in September 2015.

The primary objective of this EDR is to present the plans and procedures for remediation of the Site. The major elements discussed in this EDR include:

- Site background
- Nature and extent of contamination
- Completed remedial actions
- Cleanup requirements
- General description of cleanup action
- Permits
- Site preparation
- Soil excavation and disposal
- Grading and capping
- Site restoration
- Quality assurance/quality control (QA/QC)
- Health and safety
- Schedule and reporting

A Compliance Monitoring Plan (CMP) describing the performance and confirmational monitoring to be performed to verify the effectiveness of the cleanup action is included as an attachment to this document (Attachment 1).

1.1. Instructions to the Contractor

The beginning sections of this EDR (Sections 1.0 through 4.0) summarize the Site background, nature and extent of contamination, remedial actions previously performed, and remedial actions to be performed at the Site. These sections provide the background and basis for the work to be performed for the Aladdin Plating Site Remediation Project. The remaining sections of the EDR (Sections 5.0 through 22.0) present the project specifications and plans that identify the contract requirements for performing remedial actions as part of the Aladdin Plating Site Remediation Project.

The Contractor shall be under contract to Ecology. The Contractor shall base their bid submittal on the project specifications, plans, contract documents as well as background information and supporting documentation provided by Ecology and GeoEngineers. GeoEngineers will monitor the remediation progress, obtain confirmation samples, and verify that the Contractor is following the project specifications and plans on behalf of Ecology.

2.0 SITE BACKGROUND

2.1. Historical Operation and Site Use

The Site was used historically for commercial electroplating between 1958 and 1994. Chemicals present at the Site have included chromium, nickel, lead, caustic soda, sulfuric acid, and alkaline cleaners. The Site is currently owned by Pierce County and is managed by Ecology as an orphan site.

2.2. Current and Future Land Use

The Site measures approximately 100 feet long and 30 feet wide, with no building structures currently standing on the Site property. The Site property is currently unpaved and surrounded by temporary construction fencing. The Site is a corner lot northeast of the Center Street and South Alaska Street intersection and is located on the southwestern corner of Pierce County tax parcel 2855000010.

The Site is zoned by the City of Tacoma as M1-Light Industrial. This zoning allows for mixed-use, including the following: commercial businesses, parks, warehouses, vehicle service, and wholesale in addition to other permitted site uses (Title 13-Land Use Regulatory Code). There are no current planned uses for the Property.

2.3. Previous Site Investigations

This section identifies and summarizes the scope of previous environmental assessments and investigations that have been completed at the Site. Three investigations were performed at the Site from 2005 to 2007 by Ecology and Landau Associates to characterize Site soil and groundwater. Groundwater monitoring wells were installed both on-property and off-property, including wells screened in the shallow aquifer from approximately 30 to 45 feet below ground surface (bgs) to assess impacts to the shallow aquifer, and one well screened from approximately 70 to 80 feet bgs to characterize deeper groundwater conditions. The deeper aquifer is confined from the shallow aquifer by a layer of dense, non-plastic silt identified at depths ranging from approximately 40 to 55 feet bgs. Site contaminants in soil are: total chromium, hexavalent chromium, lead, and nickel. Site contaminants in shallow groundwater are; total chromium, hexavalent chromium, and nickel. Four rounds of groundwater monitoring with chemical analysis and groundwater level measurements, and an additional nine rounds of groundwater level measurements, were conducted at the Site from 2005 to 2007 from both on-property and off-property wells in both shallow and deep aquifer wells. The lateral extent of Site contaminants was not defined within the context of those investigations and monitoring events.

2.3.1. Summer 2005 Department of Ecology Demolition and Sampling

Following designation of the Site as an orphan site, Ecology oversaw demolition of the former electroplating building and conducted an initial soil and groundwater investigation in July 2005. Prior to demolition, shallow Site groundwater was characterized in June 2005 by chemical analysis of samples collected from six direct push probes completed at approximately 38 to 40 feet bgs. Groundwater samples contained concentrations of nickel and/or chromium greater than their respective MTCA A or B cleanup levels.

Following demolition, nine test pits were completed in July 2005 to characterize soil chemical conditions to depths ranging from 15 to 17 feet bgs. Soil samples were obtained from each test pit for chemical analysis. Samples from two test pits contained metals in shallow soil at concentrations greater than their respective MTCA Method A or B cleanup levels, including cadmium, total chromium, copper, lead, and nickel. Following building demolition and test pit sample analysis, cleanup of the property entailed removal of 40 tons of contaminated shallow soil to depths ranging from 2 to 2.5 feet bgs and 47 tons of contaminated concrete under Ecology oversight for off-site disposal. Ecology conducted post-excavation confirmation soil sampling at the final cleanup excavation depths. No documentation of the lateral or vertical extent of the excavation or disposal records was available from Ecology. Confirmation soil samples were analyzed for cadmium, total chromium, hexavalent chromium, copper, lead, and nickel, which displayed concentrations below their respective MTCA soil cleanup levels for these analytes.

2.3.2. November 2005 Landau Associates Phase I Soil and Groundwater Investigation

In November 2005, Landau Associates (Landau Associates, 2006) installed five on-property groundwater monitoring wells to characterize groundwater in both the shallow and deep aquifers at the Site (MW-1s through MW-4s, and MW-4d; Figure 2) as part of their soil and groundwater investigation. Wells screened in the shallow aquifer are denoted with the letter “s”; the well screened in the deeper aquifer is denoted by the letter “d.” Shallow soil was sampled from each boring at the time of well installation, and groundwater was sampled for chemical analysis in November 2005. Additional groundwater level measurements, but no groundwater samples, were collected in January 2006.

The data indicated that chromium, lead, and nickel were present in shallow groundwater beneath the west-central side of the property (near MW-2s) and beneath the east-northeast side of the property (in the vicinity of MW-4s/4d). Metals concentrations in shallow groundwater, with the exception of nickel, were reported below MTCA cleanup levels; the concentration of nickel in groundwater exceeded the MTCA cleanup level of 320 micrograms per liter (µg/L). Groundwater flow direction could not be determined due to an essentially flat gradient across the small area of the property. Landau Associates recommended additional groundwater sampling to verify contaminant concentrations in groundwater and the installation of additional off-property monitoring wells to better evaluate groundwater flow direction.

2.3.3. June-July 2006 Landau Associates Groundwater Investigation

In June 2006, Landau Associates (Landau Associates, 2007b) installed three additional off-property groundwater monitoring wells (MW-5s, MW-6s, and MW7s) in the City of Tacoma right-of-way. In July 2006, Landau Associates conducted one round of groundwater monitoring at all eight (both on-property and newly-installed off-property) Site wells, collecting groundwater level measurements and sampling for chemical analysis.

Groundwater monitoring results indicated an east-southeast groundwater flow direction. Analytical results from testing within the shallow aquifer showed concentrations of nickel in groundwater from MW-3s and total chromium, hexavalent chromium, and nickel in groundwater from MW-4s above their respective MTCA cleanup levels. Landau Associates recommended additional groundwater monitoring, including a comparison between total and dissolved metals in groundwater, and monthly gauging of groundwater levels from all Site wells.

2.3.4. 2006-2007 Groundwater Monitoring

Landau Associates (Landau Associates, 2007a) conducted two groundwater sampling events for chemical analysis in October 2006 and March 2007, combined with nine groundwater level monitoring events performed roughly monthly between September 2006 and May 2007. The purpose of this study was to evaluate temporal variation in contaminant concentrations in shallow groundwater and groundwater flow direction in all Site wells.

Groundwater gauging results confirmed an east-southeast groundwater flow direction. Laboratory analytical results showed that concentrations of hexavalent chromium and nickel in groundwater in well MW-3s, and chromium, hexavalent chromium, and nickel in well MW-4s, exceeded their respective MTCA cleanup levels. Landau Associates concluded that, based on the sampling locations, the downgradient limits of hexavalent chromium and nickel in groundwater remained unknown. They further concluded that concentrations of metals in groundwater increased seasonally with higher groundwater elevations.

In April 2007, Landau Associates proposed additional remedial investigation services to define the extent of on-property and off-property impacts in soil and groundwater at the Site to assess and select effective remediation strategies to achieve Site cleanup (Landau Associates, 2007b). Landau Associates' proposed remedial investigation and feasibility study (RI/FS) would support a Cleanup Action Plan (CAP) addressing Site soil and groundwater contamination. Landau Associates' proposed feasibility study was not implemented at that time.

2.3.5. 2014 Remedial Investigation

A remedial investigation (RI) was completed in 2014 by GeoEngineers for Ecology to address data gaps identified from previous investigations. The objective of the RI was to collect sufficient data to assess the current vertical extent of contamination in Site soil and horizontal downgradient extent of contamination in shallow groundwater for the preparation of a feasibility study and the CAP. The results of the investigation activities were presented in a report prepared by GeoEngineers in June 2014 (GeoEngineers, 2014b) and are summarized below in Section 2.6.

2.4. Geology and Hydrogeology

This section summarizes the geology and hydrogeology of the shallow contaminated zone beneath the Site based on the results of previous Site investigations as described in the CAP (GeoEngineers, 2014a). The shallow contaminated zone consists of nickel, chromium and hexavalent chromium contaminated soil shallower than 20 feet bgs and the shallow unconfined aquifer present at a depth of approximately 25 feet bgs. As demonstrated through previous studies, the deep aquifer is separated from the contaminated zone by a thick silt layer and testing of the deep aquifer indicated that contaminants of concern are not present at concentrations greater than MTCA cleanup levels. Therefore the remainder of this RI is focused on the shallow zone.

2.4.1. Soil

Soil across the Property was generally characterized as brown silty sand to sand with silt, with varying gravel content. No definitive geologic contact was identified delineating fill material from native soils. Perched groundwater was noted in some boring cores at depths ranging from approximately 6.5 to 8 feet bgs. Soil types encountered in exploration borings downgradient of the Site generally consisted of brown silty sand to sand with silt with varying gravel content, and occasional poorly graded gravel layers up to 2 feet in thickness to depths of approximately 13 to 20 feet bgs; at depths from approximately 15 feet bgs to the explored depth of 35 to 40 feet bgs, soil was generally characterized as brown to grey, fine to medium sand with occasional gravel and silt content, and occasional poorly graded gravel layers. The geology in the vicinity of the Site is described in the Geologic map of the south half of the Tacoma Quadrangle, Pierce County, Washington (Walsh, 1987). Soils at the site are mapped as Vashon glacial drift overlying Vashon till. North of the Site soils are identified as Vashon till.

2.4.2. Groundwater

Shallow groundwater at the Site has been documented in the fine to medium sand unit with occasional gravel and silt (the "shallow aquifer"). The shallow aquifer is underlain by a confining layer of dense silt occurring at depths ranging from 40 to 55 feet bgs. The shallow aquifer was encountered at depths ranging from 21.5 to 27 feet bgs. The groundwater flow direction at the Site is to the east-southeast.

2.5. Site Cleanup Levels

Soil and groundwater cleanup levels for contaminants of concern (COC) were developed for the Site. The objective of the proposed remedial action is to eliminate, reduce, or otherwise control to the extent feasible and practicable, unacceptable risks to human health and the environment posed by hazardous substances in soil and groundwater in accordance with the MTCA Cleanup Regulation (WAC 173-340) and other applicable regulatory requirements. Specifically, the objective of the cleanup is to mitigate risks associated with the following potential exposure routes and receptors:

- Contact (dermal, incidental ingestion, or inhalation) by residents, visitors, workers (including excavation workers) and other Site users with hazardous substances in soil; and
- Ingestion of Site contaminants in groundwater as drinking water.

Site-specific cleanup levels for COCs in soil and groundwater are discussed in the following sections. Information regarding the identification of cleanup levels is provided in the CAP (GeoEngineers, 2014a).

2.5.1. Soil

The following COCs and cleanup levels for Site soil were identified as described in the CAP (GeoEngineers, 2014a):

- Total chromium — 2,000 milligrams per kilogram (mg/kg)
- Hexavalent chromium — 18.4 mg/kg
- Lead — 250 mg/kg
- Nickel — 417 mg/kg

Based on current zoning and anticipated future use, proposed cleanup levels for Site soil were developed for unrestricted land use and were based on following regulatory criteria:

- MTCA Method A Soil Cleanup Levels. MTCA Method A values for unrestricted land uses are published in MTCA Table 740-1 (Chapter 173-340-900 WAC).
- MTCA Method B Soil Cleanup Levels. MTCA Method B carcinogen and non-carcinogen values for human health protection (incidental soil ingestion), and for protection of groundwater as drinking water, were obtained from Ecology's Cleanup Levels and Risk Calculation (CLARC) database.

In addition to the regulatory criteria listed above, Washington State soil background concentrations for metals (Ecology, 1994) are considered in accordance with WAC 173-340-709 and WAC 173-340-705(6). In general, the lowest of the regulatory criteria listed above were identified as the proposed soil cleanup levels, unless the lowest regulatory criterion was less than the background concentration, the proposed soil cleanup level was set at the background concentration. Soil cleanup levels for the Site COCs are presented in Table 1.

2.5.2. Groundwater

The following COCs and cleanup levels for Site groundwater were identified as described in the CAP (GeoEngineers, 2014a):

- Total chromium 50 µg/L
- Trivalent Chromium 24,000 µg/L
- Hexavalent chromium 48 µg/L
- Lead 15 µg/L
- Nickel 320 µg/L

While not used for drinking water, shallow groundwater at the Site has been affected by Site contaminants in soil, and can potentially affect local drinking water supply. Therefore, proposed cleanup levels for groundwater are developed for protection of drinking water and are selected from available state and federal criteria listed below:

- Safe Drinking Water Act
- MTCA Method B Formula Values. MTCA Method B groundwater carcinogen and non-carcinogen standard formula values for human health protection were obtained from Ecology's CLARC database.

In general, the lowest of the regulatory criterion listed above are identified as the proposed groundwater cleanup level. Groundwater cleanup levels for the Site COCs are also presented in Table 2.

2.6. Nature and Extent of Contamination

2.6.1. Soil

Soil present at the Site contains metals including hexavalent chromium, lead, and nickel at concentrations above respective MTCA cleanup levels generally in shallow soil (0.5 to 3.5 feet bgs) and one deeper sample (7.0-7.5 feet bgs) in the central portion of the Site, where historical chrome and nickel plating operations occurred. Total chromium was detected in all soil borings, but did not exceed the MTCA cleanup level. Exceedances of the MTCA Method B cleanup level for direct contact for nickel were detected in deeper soil.

Contaminant source concentrations in soil of chromium, lead, and nickel are generally limited at the Site property to shallow depths, with exceptions at limited locations where nickel contamination was identified at greater depths, and where hexavalent chromium exceedance was identified at 7.0 to 7.5 feet bgs. Figures summarizing contaminant concentrations in soil, based on previous investigations, are presented in Attachment 2.

2.6.2. Groundwater

One recent round of groundwater monitoring was completed at the Site in monitoring wells MW-1 through MW-7 in 2014. Contaminants of concern were detected above MTCA cleanup levels in groundwater in on-property monitoring well MW-4s (total chromium, total nickel, and dissolved nickel). These same contaminants of concern exceeded cleanup levels in groundwater only in soil borings immediately downgradient of well MW-4s.

At groundwater sample locations where total chromium exceeded the MTCA Method A cleanup level of 50 μg/L, results of speciated analysis for hexavalent chromium were either below the MTCA Method B cleanup level of 48 μg/L or below laboratory detection. The data indicate that impacts to the shallow groundwater aquifer exceeding cleanup levels are limited to a contaminant source near MW-4s and downgradient locations within 200 feet of the property for total chromium and nickel. The absence of detectable concentrations of hexavalent chromium in grab groundwater samples from nearby soil borings indicate that total chromium detected in groundwater at these locations represents trivalent chromium, which limits the extent of exceedances of chromium in Site groundwater to the source property with no off-property impacts. The results of groundwater monitoring performed at the Site are provided in Attachment 3.

3.0 PREVIOUS REMEDIAL ACTIONS

As described above in Section 2.3.1, limited remedial actions included the following:

- Ecology oversaw demolition of the former electroplating building and conducted an initial soil and groundwater investigation in July 2005.
- Following demolition, nine test pits were completed to depths ranging from 15 to 17 feet bgs. Soil samples were obtained and analyzed from test pits contained metals at concentrations greater than their respective MTCA Method A or B cleanup levels, including cadmium, total chromium, copper, lead, and nickel.
- 40 tons of contaminated shallow soil and 47 tons of contaminated concrete generated during demolition were excavated under Ecology oversight and removed for off-site disposal.
- Confirmation soil samples were analyzed for cadmium, total chromium, hexavalent chromium, copper, lead, and nickel, which displayed concentrations below their respective MTCA soil cleanup levels for these analytes.

4.0 REMAINING REMEDIAL ACTIONS

The remaining remedial actions to be completed to implement the preferred cleanup alternative specified in the CAP include the following:

- Removal and off-site disposal of metals-contaminated soil resulting from historical metal plating activities at the subject property that is the source of metals-contaminated shallow groundwater on, and downgradient of, the Site.
- Groundwater monitoring well replacement in the shallow aquifer.
- Compliance monitoring in both soil and groundwater.

Additional components of the preferred cleanup alternative specified in the CAP include confirmational groundwater monitoring to confirm the reduction of metals concentrations leached to groundwater after the contaminated soil is removed. Groundwater monitoring will be implemented after completion of the remedial action and is not part of the work specified in this EDR.

The following sections (i.e., Sections 4.1 through 4.3) provide an overview of the remaining remedial actions to be performed as part of this EDR to implement the preferred remedial alternative. Specifications for completing the remaining remedial actions are presented in Sections 5.0 through 22.0.

4.1. Remedial Excavation and Off-Site Disposal

Remedial excavation will be completed at the Site to remove soil that was identified to contain metals at concentrations greater than the Site-specific cleanup standards developed in the RI and adopted in the FS that may be a source of metals leaching to groundwater. The contaminated soil to be removed include total chromium, hexavalent chromium, lead, and nickel in shallow soil (0.5 to 3.5 feet bgs) and one deeper sample location (7.0-7.5 feet bgs) in the central portion of the Site, where historical chrome and nickel plating operations occurred. The results of chemical analyses are summarized in figures displaying contaminant concentrations in soil in Attachment 2.

The limits of excavation were established based on the results of previous investigation. When the limits of excavation are reached, verification samples will be collected from the sidewalls and base (i.e., bottom) of each excavation by the Engineer in accordance with the Compliance Monitoring Plan prepared for the Aladdin Plating Remediation Project (Attachment 1) and analyzed at a chemical analytical laboratory.

Where the verification sample results are less than the Site-specific cleanup criteria (see Section 2.5.1), no further excavation will be performed. Where the verification sample results are greater than the criteria, additional excavation will be performed, as directed by the Engineer, to remove soil with concentrations greater than the criteria. Following any additional excavation, additional verification samples will be collected by the Engineer and analyzed to verify that the remaining soil meets the criteria. The excavations will be backfilled and compacted with clean imported pit run sand and gravel after verification sampling indicates that the contaminated soil removal has been completed.

The soil excavated from the Site will be stockpiled for characterization in accordance with the Compliance Monitoring Plan (Attachment 1) prior to disposal. Samples of stockpiled soil removed from the excavation will be collected by the Engineer and analyzed at a chemical analytical laboratory. The results from stockpiled soil sampling and analysis will be compared to landfill disposal criteria by the Engineer to identify the appropriate disposal location. The Engineer will transmit the sample results to the landfill for authorization and acceptance of the stockpiled material for disposal. Upon receipt of authorization and acceptance for disposal, the Contractor shall transport the stockpiled material to the landfill for disposal and provide the documentation of disposal to the Engineer. Sampling and analysis, comparison of the sample results to landfill criteria, and acceptance of the stockpiled material by the landfill will be performed/obtained prior to transport of the stockpiled soil to a landfill for disposal.

4.2. Groundwater Monitoring Well Replacement

Groundwater sampling and analysis to evaluate the long-term effectiveness of the remedial excavation will be performed following the completion of the remedial action. New groundwater monitoring wells will be installed at the Site as part of the Aladdin Plating Site Remediation Project that will be used for future compliance monitoring.

Monitoring wells currently present at the Property (MW-1s, MW-2s, MW-3s, and MW-4s/4d) will be decommissioned as part of the remedial action to facilitate remedial construction activities (Figure 3). The monitoring wells will be decommissioned by a Washington State licensed driller in accordance with the Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 WAC). The well logs for the wells that are to be decommissioned are provided in Attachment 4.

One replacement monitoring well will be installed at the Property to allow characterization of shallow groundwater quality conditions at the approximate location of existing monitoring well MW-4s/4d, and one additional downgradient well located off-property (Figure 3). Groundwater quality monitoring will be for the contaminants of concern outlined in Section 2.5.2. Drilling and construction of the replacement monitoring wells will be conducted by a Washington State licensed driller in accordance with the Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 WAC) and observed by a licensed geologist. Monitoring well borings will be drilled using a hollow-stem auger drill rig. The monitoring wells are to be installed to depths between approximately 30 and 40 feet bgs. A licensed geologist will monitor and log the borings and well installation.

4.3. Compliance Monitoring

Compliance monitoring will be implemented during the Site remedial action in accordance with the CAP (GeoEngineers, 2014a), Compliance Monitoring Plan provided in Attachment 1, and WAC 173-340-410. The three types of compliance monitoring to be conducted include protection monitoring, performance monitoring, and confirmational monitoring. The objectives of compliance monitoring are to:

- Protect human health and the environment during the remedial action (protection monitoring),
- Verify that cleanup standards have been achieved and, if appropriate, that other performance standards have been achieved such as monitoring necessary to demonstrate compliance with a permit or substantive requirements of other programs (performance monitoring), and
- Confirm the long-term effectiveness of the remedial action (confirmational monitoring).

Compliance monitoring activities are described in the following sections.

4.3.1. Protection Monitoring

Protection monitoring will include monitoring of worker health and safety and environmental protection practices such as stormwater, erosion, and sediment controls. The purpose of protection monitoring is to confirm that human health and the environment are adequately protected during the remedial action.

4.3.1.1. Worker Health and Safety

Remediation-related construction activities will be performed in accordance with the requirements of the Washington Industrial Safety and Health Act (WISHA) (Revised Code of Washington [RCW] 49.17) and the Federal Occupational Safety and Health Act (OSHA) (29 CFR 1910, 1926). These regulations include requirements that workers are to be protected from exposure to contaminants. A site-specific Health and Safety Plan (HASP) applicable to the Engineers' work is included as Appendix A of the Compliance Monitoring Plan (Attachment 1). The selected construction Contractor shall be required to prepare and submit a separate HASP for use by the Contractor's personnel. Personnel engaged in work that involves hazardous material excavation and handling shall comply with the provisions of WAC 173-340-810 (MTCA Cleanup Regulation, Worker Safety and Health) and be Hazardous Waste Operations and Emergency Response Standard (HAZWOPER), OSHA and/or WISHA certified.

4.3.1.2. Environmental Protection

Environmental protection measures consisting of best management practices (BMPs) for stormwater, sediment, drainage, and erosion control; spill prevention and pollution control; and all other controls needed to protect environmental quality during remedial actions will be implemented. Environmental protection measures including a Spill Prevention, Control and Countermeasure (SPCC) Plan will be prepared and provided by the selected Contractor in the Contractor's submittal package. The Contractor shall be required to conform to all permits for the project and implement the Stormwater Pollution Prevention Plan (SWPPP) (Attachment 5) including the installation, inspection and maintenance of BMPs necessary for stormwater management, temporary erosion and sediment control measures, and SPCC measures, as necessary, for the duration of the project. The Aladdin Plating Site has been exempted from the Washington State Construction Stormwater General Permit because less than one acre of disturbance will occur as part of the remedial action project and stormwater does not discharge to surface water. However, work performed by the Contractor shall generally comply with the provisions of the general stormwater permit as reflected in the project specific SWPPP. If any governmental agency determines that the Contractor's environmental protection measures are inadequate to meet the intent of applicable regulations, the Contractor shall be required to implement additional stormwater runoff, erosion control, and/or SPCC measures to address the deficiencies.

4.3.2. Performance Monitoring

Performance monitoring will be conducted to verify that the remedial action attains the cleanup levels established for the Site (see Section 2.5.1) as well as other performance standards including characterization and monitoring necessary to demonstrate compliance with permit, disposal, and discharge requirements. Performance monitoring to be performed as part of the remedial action includes the following:

- Limits of remedial excavation verification.
- Water characterization prior to discharge.

The following sections further describe performance monitoring to be performed at the Site as part of the remedial action.

4.3.2.1. Limits of Remedial Excavation Verification

Remedial excavation will be completed at the Site to remove soil containing total chromium, hexavalent chromium, lead, and nickel (at concentrations greater than the Site-specific cleanup criteria (WAC 173-303-090; also summarized in Section 2.5.1). Soil sampling and analysis will be performed at the limits of the remedial excavations to verify removal of soil with concentrations greater than Site-specific cleanup criteria.

Where the verification sample results are less than the Site-specific cleanup criteria, no further excavation will be performed. Where the verification sample results are greater than the criteria, additional excavation will be performed to remove soil with concentrations greater than the criteria. Following any additional excavation, additional verification samples will be collected and analyzed to verify that the remaining soil meets the criteria. Ecology shall be notified of any additional actions (i.e., additional excavation and sampling) to be performed in response to the verification sample results.

4.3.2.2. Storm Water Characterization Prior to Discharge

All storm water that is collected as part of the remedial action and any water resulting from dewatering of excavations or excavated material, dust control, and decontamination activities on the Site will be discharged to the completed remedial excavation for infiltration. No sampling or analysis will be necessary prior to discharge.

4.4. Analyses to Support Compliance Monitoring

Chemical analyses will be completed as part of compliance monitoring during the Aladdin Plating Site Remediation Project. The chemical analyses will be performed by an Ecology-approved analytical laboratory identified by the Engineer and contracted to the Contractor. Samples for chemical analysis will be collected by the Engineer and submitted to the analytical laboratory. The results from the chemical analyses will be used to evaluate compliance with the requirements identified in the CMP as well as the requirements specified in the contract documents.

5.0 CONTRACT WORK

This section presents an overview of the work to be performed to complete the remedial actions at the Aladdin Plating Site as part of the Aladdin Plating Site Remediation Project. The Contractor shall perform the work in accordance with the contract documents, project specifications provided in the following sections, as well as the project plans detailing the work presented on Project Engineering Drawings Sheets S-01 through S-06.

The work generally consists of the following:

- Mobilization to and Demobilization from the Site.
- Site preparation activities including establishing Site controls and security measures and implementation of temporary erosion and sediment controls and stormwater pollution prevention measures.
- Protection of underground and above ground utilities and structures at the Site.
- Grubbing and clearing vegetation.
- Remedial excavation and backfill.

- Material management, loading, transport, and disposal, or recycling.
- Site restoration.
- Compliance monitoring.
- Quality assurance/Quality control.
- Health and Safety.

The Contractor shall phase and stage work so as to meet or exceed the project schedule while not impacting adjacent business operations. The Contractor shall provide traffic control, and furnish, erect, and maintain temporary fences, vehicular barricades, signs, lights, and cones as may be necessary to control access to adjacent streets and to warn the public and on-site personnel of work in progress as well secure the Site from general public access.

The Contractor shall coordinate all work with the Project Engineer. Coordination with the Project Engineer will include allowing the Engineer to perform observations of the work, attend project meetings and collect samples for physical and/or chemical analysis. The Engineer anticipates collecting samples for analysis from the following at a minimum:

- The Contractor's proposed sources of backfill material; and
- Soil at the limits (i.e., base and sidewalls) of the area to be excavated to remove soil with contaminant concentrations greater than Site-specific cleanup criteria.

The Contractor shall be aware that chemical and/or physical analysis may take up to 7 (seven) working days to complete. The Engineer will submit all samples to an Ecology-approved laboratory on a one-week turnaround time to facilitate performance of the work. The Contractor shall plan the work around the required sampling and analysis to continue progress toward completion of the project. The Engineer will establish a contract with the laboratory to perform chemical analyses.

The following sections provide the project specifications for the contract work.

6.0 REGULATORY AND PERMITTING REQUIREMENTS

The Contractor shall comply with the regulatory and permitting requirements identified in the following section during performance of the work. Compliance with the permitting and regulatory requirements identified in the following section as well as any other regulatory or permitting requirements identified in the contract documents or necessary to complete the work will be incidental to the work performed as part of the Aladdin Plating Site Remediation Project.

6.1. References

All work performed as part of the Aladdin Plating Site Remediation Project shall be completed in accordance with the Contract Documents, the requirements specified in this document, and, insofar as they may apply, the most current requirements of the following agencies, organizations, codes, specifications, standards and guides, as well as others as specified elsewhere in these specifications:

- American Conference of Governmental Industrial Hygienists (ACGIH)
- American Public Works Association (APWA)

- ASTM International (ASTM)
- Environmental Protection Agency (EPA)
- Hazardous Waste Operations and Emergency Response (HAZWOPER)
- Model Toxics Control Act (MTCA)
- National Institute of Occupational Safety and Health (NIOSH)
- Occupational Safety and Health Administration (OSHA)
- Washington Administrative Code (WAC)
- Washington Industrial Safety and Health Act (WISHA)
- Washington State Department of Transportation (WSDOT)

6.2. Regulatory and Permitting Requirements

The Aladdin Plating Site Remediation Project is being performed pursuant to MTCA. The remedial action must comply with the substantive requirements of the laws, regulations, and permits thereof. Regulatory requirements, permits, and substantive requirements applicable to the work are presented in the following sections.

6.2.1. Solid and Hazardous/Dangerous Waste Management

Soil will be generated from Site preparation and excavation of soil exceeding Site cleanup levels. The material that is generated will be disposed of as solid or Hazardous/Dangerous Waste based on the material sources and characteristics.

Soil that is excavated from the remedial excavation will be placed in separate stockpiles prior to transportation and disposal at a permitted Subtitle D or C landfill. Sampling and analysis of stockpiled material removed from excavations will be performed as described in Section 4.1 to evaluate whether contaminants present in the material will result in the material being designated as “characteristic” Dangerous Waste (WAC 173-303-090). Stockpile samples will be analyzed for contaminants of concern. Material has the potential to designate as a Dangerous Waste if the contaminant concentration is greater than 20 times[1] the associated Toxicity Characteristic Criteria listed in WAC 173-303-090(8).

The Washington State Dangerous Waste Regulations (Chapter 173-303 WAC) may apply to the material generated during excavation at the Aladdin Plating Site as a result of stockpile analysis. Analytical data for soil generated during previous investigations at the Site indicated the presence of metals at concentrations greater than Dangerous Waste Toxicity Characteristic criteria.

Material that designates as a Dangerous Waste, will be managed by the Contractor in accordance with Washington State Dangerous Waste Regulations (Chapter 173-303 WAC). Material that designates as

[1] This is referred to as the “20-times rule” and is described in a September 21, 1992 EPA letter titled “Calculation of TCLP Concentrations from Total Concentrations”. This reference is available at http://yosemite.epa.gov/osw/rcra.nsf/ea6e50dc6214725285256bf00063269d/95e9e57b91ea2e9f8525670f006c0acd!OpenDocument

Dangerous Waste will be stored, handled, manifested, and transported in accordance with Dangerous Waste Regulations to a Subtitle C Landfill. Material that does not designate as a Dangerous Waste will be managed and disposed of by the Contractor as solid waste and transported to a Subtitle D Landfill approved by the Engineer.

Draft waste disposal profiles and preliminary landfill use authorizations for disposal at a Republic Services, Roosevelt Regional Municipal Solid Waste Landfill (i.e., Subtitle D Landfill) and Chemical Waste Management Landfill in Arlington, Oregon (i.e., Subtitle C Landfill) are provided in Attachment 6. Final landfill use authorizations will be obtained by the Engineer based on the results of stockpile sampling and analysis prior to transport and disposal.

6.3. State Environmental Policy Act

The State Environmental Policy Act (SEPA) (RCW 43.21C; WAC 197-11) and the SEPA procedures (WAC 173-802) are intended to ensure that state and local government officials consider environmental values when making decisions. Ecology is the lead SEPA agency for the remedial action at the Aladdin Plating Site.

GeoEngineers completed a SEPA checklist and furnished a copy to Ecology on December 10, 2014. The SEPA checklist for the project is provided in Attachment 7.

6.3.1. Erosion and Sediment Control and Water Management

Water management and erosion and sediment control for the protection of surface water during the work will be conducted in general accordance with the requirements of the Washington State Water Pollution Control Act (RCW 90.48) as described in the Construction Stormwater General Permit.

A Construction Stormwater General Permit, administered by Ecology, is required at construction sites for clearing, grading, and excavation that results in the disturbance of one or more acres and where stormwater discharges to surface waters of the State. The Aladdin Plating Site has been exempted from this permit because less than one acre of disturbance will occur as part of the remedial action project and stormwater does not discharge to surface water. However, work performed by the Contractor shall generally comply with the provisions of the general stormwater permit as reflected in the project specific SWPPP (Attachment 5). A Notice of Intent for application for a Construction Stormwater General Permit was submitted to the Ecology Water Quality Program on June 26, 2015. Exemption from the Construction Stormwater General Permit was received from Ecology on August 6, 2015. A copy of the exemption is included with the SWPPP in Attachment 5.

Additional water that may be generated as part of the work at the Aladdin Plating Site includes, but is not limited to, dust control water and water resulting from decontamination activities. Due to the separation between the base of excavation and historical groundwater table, groundwater is not expected to be encountered during excavation. The Contractor shall be aware that all water generated as part of the remedial actions, including stormwater runoff, will be collected as necessary, and discharged to the completed remedial excavation for infiltration.

6.3.2. City of Tacoma Grading Permit

Grading permits are used by the City of Tacoma for excavation and/or fill work. Work to be performed as part of the Aladdin Plating Site Remediation Project will adhere to the procedural requirements of the Grading Permit, and the requirements of the Grading Permit will be met by the remedial Contractor during the Site work.

Grading and excavation requirements include, but are not limited to, the following:

- The excavation and grading surface shall be no steeper than is safe for the intended use.
- Detrimental amounts of organic material shall not be permitted in backfill materials.
- The faces of cut and fill slopes shall be prepared and maintained to control against erosion. This control may consist of covering the areas with plastic sheeting or other BMPs. The protection for slope surfaces shall be installed as soon as practicable and maintained throughout excavation activities.

6.3.3. Puget Sound Clean Air Agency, Regulation I of the Puget Sound Clean Air Agency

The work shall be performed so as to not allow the emission of any air contaminants in violation of the visual standard, to not allow the emission of fugitive dust, and to not allow the emission of particulate matter in violation of the regulation. Equipment utilized on Site for the work shall be maintained in such a manner as to not be in violation of the regulation.

Work at the Site will be performed using construction techniques to minimize dust and particulate emissions from the Site and maintain emissions below standards promulgated by the Puget Sound Clean Air Agency.

6.3.4. Other Applicable Regulatory Requirements

The following are other applicable regulatory requirements for the work to be performed at the Aladdin Plating Site:

- **Health and Safety** – Remediation-related work activities will be performed in accordance with the requirements of the Washington Industrial Safety and Health Act (RCW 49.17) and the Federal Occupational Safety and Health Act (29 CFR 1910, 1926). The associated regulations include requirements that workers are to be protected from exposure to harmful concentrations of contaminants. The project health and safety requirements are identified in Section 17.
- **Minimum Standards for Construction and Maintenance of Wells** – Groundwater monitoring well decommissioning and installation of new monitoring wells are to be performed in accordance with the requirements identified in Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 WAC). Groundwater monitoring wells currently present at the Site will be decommissioned by the Contractor during Site preparation activities. In addition, new monitoring wells will be installed by the Contractor as part of Site restoration activities.

7.0 EXISTING CONDITIONS

Existing Site conditions are summarized in this section and are shown on Sheet S-04. The Contractor shall confirm all existing Site conditions prior to the Contractor submitting a bid for the Aladdin Plating Site Remediation Project.

The existing site grade at the Property is from an elevation of approximately 247.5 feet National Geodetic Vertical Datum (NGVD) 29 on the northwest boundary of the Site to approximately 245.0 feet NGVD 29 on the eastern boundary of the Site.

Temporary chain-link fencing is present along the general boundaries of the Property. Areas of vegetation (i.e., bushes, shrubs, and grass) are present on the southeast portion of the Property. Four 55-gallon drums of soil and one 55-gallon drum of water are present on the Property from the 2014 remedial investigation.

Additionally, five groundwater monitoring wells are currently present on the Property (monitoring wells MW-1s, MW-2s, MW-3s, and MW-4s/4d).

The Property is bounded by the following:

- Center Street borders the southern boundary of the Property.
- South Alaska Street, an unpaved right-of-way, borders the western boundary of the Property.
- A vehicle storage yard for Bill's Towing & Garage borders the northern and northeastern boundaries of the Property.
- An elevated billboard and a building housing Corner Stone Missionary Baptist Church border the southeastern boundary of the Property.

8.0 HOURS OF OPERATION AND CONSTRUCTION STAGING AREA

The Contractor shall conduct its operations in a manner that causes the least possible obstruction and inconvenience to the operations of surrounding businesses. The Contractor shall coordinate, phase, and schedule all work so that it does not affect other business operations and is completed within the requirements of City of Tacoma code. No additional payment or claims of delay or other damages shall arise based on coordination, phasing, or scheduling of the work around business operations or meeting the requirements of the City of Tacoma code during the work.

8.1. Work Hours

The work shall be performed during City of Tacoma-approved work hours. Work hours generally approved by the City of Tacoma are 7:00 AM to 9:00 PM weekdays, 9:00 AM to 9:00 PM weekends. Exceptions to the allowable work hours may be made at the discretion of the City of Tacoma.

8.2. Noise

Construction noise including, but not limited to, noise generated by construction equipment, work activities, and personnel will be limited to City of Tacoma-approved work hours and meet the requirements of the City of Tacoma code, Chapter 8.122.080 and 8.122.090.

8.3. Construction Staging Area

The entire Aladdin Plating property will be made available to the Contractor for construction staging. The Property is expected to be used by the Contractor for location of construction equipment parking and storage, storage of supplies, and material management and containment areas, as well as management and storage of all other equipment and materials required to perform the work.

The Contractor shall coordinate, as appropriate, project-related vehicle parking and truck staging (ex., while waiting to load or unload) either on-site or along South Alaska Street.

9.0 SITE ACCESS, TEMPORARY SITE CONTROLS, MOBILIZATION, AND SECURITY

Access to the work area (entry and exit) will be from Center Street. A temporary chain-link gate will be installed located at the southern fence of the work area on Center Street at the entrance to the Property as shown on Sheet S-04. Additional access to the Property may be provided by removal of temporary fencing along the western boundary of the Property at South Alaska Street.

The Site entrance and access will be stabilized (using quarry spalls or other relevant material) to minimize the tracking of sediment resulting from the work onto Center Street. Street sweeping and street cleaning will be employed, as necessary, to prevent sediment from being tracked onto Center Street and/or from entering stormwater and state waters. Construction access for the work at the Aladdin Plating Site will be performed as shown on Sheet S-04.

The Contractor shall be responsible for providing and installing temporary Site fencing, barricades, signage, and other traffic control devices, as necessary, for controlling the work area. The Contractor shall furnish, erect and maintain temporary fences, vehicular barricades, signs, lights, and cones, as may be necessary to provide access to adjacent streets; to warn the public and construction personnel of work in progress; as well as provide for Site security throughout the work. Coordination of all traffic and traffic control devices shall be in accordance with the current City of Tacoma code. The Contractor shall mobilize all equipment and materials necessary to conduct remedial operations upon establishing Site access and controls. The Contractor shall coordinate all work with other Contractors in the area, as necessary. The work area shall also be secured by fencing when the Contractor is not performing work to not allow access by unauthorized personnel.

The unit cost for work performed for Site Access, Temporary Site Controls, Mobilization, and Security will include all labor, equipment, and materials as needed to complete the work described in this section. Payment for Site Access, Temporary Site Controls, and Security will be measured on a lump sum unit basis at the unit price shown on the bid form (Attachment 8). Measurement for the lump sum item of Site Access, Temporary Site Controls, and Security will be estimated percent completed as approved by the Site Engineer. No additional payment or claims of delay or other damages shall arise based on coordination or phasing, as well as requirements to maintain Site Access, Temporary Site Controls, and Security during the work.

10.0 SITE PREPARATION

Site preparation shall be performed to support the work to compete the remedial actions at the Site. The work will be performed by the Contractor in accordance with the specifications in the following sections and as shown on Sheet S-04.

10.1. Erosion Control/Stormwater Pollution Prevention

The Contractor shall employ Best Management Practices (BMPs) to control erosion during all work including, but not limited to, Site preparation, demolition, excavation, backfilling, grading, capping, and restoration activities. The Contractor shall implement erosion control and stormwater pollution prevention BMPs consistent with the following:

- Washington State Department of Ecology Stormwater Management Manual for Western Washington (Ecology, 2005); and
- Project Stormwater Pollution Prevention Plan (SWPPP) (Attachment 5).

The Contractor shall also implement erosion control and stormwater pollution prevention procedures in accordance with requirements of this section. Erosion control and stormwater pollution prevention procedures shall include the following:

- Installation and maintenance of temporary erosion and sediment control (TESC) measures as identified on Sheet S-04.
- Install stormwater inlet protection in catch basins potentially subject to Site runoff.
- Install stormwater controls such as silt fencing, protection barriers, and sediment traps, as needed, within the limits of work area to collect all stormwater runoff and to avoid any stormwater run-on into the work area. Stormwater controls shall be approved by the Engineer prior to placement.
- Remove sediment deposits when the deposits reach 6 inches above the pre-existing ground surface on the upgradient side of the TESC measures.
- Transfer or pump all water including stormwater runoff resulting from erosion and sediment control and stormwater pollution prevention activities into the water collection system. All water including stormwater runoff will be captured prior to leaving the Site. The requirements for the water management and disposal and the water treatment system are described in Section 10.3.
- Clear only those areas where immediate activity will take place and maintain original ground cover as long as practicable.
- Implement dust control techniques, as necessary, for construction activities that could generate dust. Dust control techniques must be approved by the Engineer prior to application. Routine maintenance of the chosen dust control technique(s) is necessary to keep dust to a minimum and to meet Northwest Clean Air Agency restrictions of airborne particulates. The Contractor shall coordinate use of water sources from public or private sources, as necessary, to provide dust control. The Contractor is responsible for acquiring a water use permit, acquiring, installing, and maintaining any equipment necessary for use of permitted water sources, and any associated expenses, as required. Water applied as dust control shall not leave the Site as surface water runoff and will be collected and pumped into the water treatment system.

- Keep streets clean of construction debris, soil, fill material, and/or mud (i.e., sediment resulting from project work) associated with construction vehicles and equipment or any other construction activity. Any sediment resulting from the work that is tracked onto pavement shall be removed by shoveling or street sweeping. The sediment resulting from the work removed by sweeping shall be combined with soil transported off site for disposal. The pavement shall not be cleaned by washing down the street, except when sweeping is ineffective. Runoff from street washing must be collected and pumped into the water treatment system. If sediment resulting from the work is tracked onto off-site pavement areas, alternative measures to keep the streets free of sediment must be implemented.

The unit cost for work performed for Erosion Control/Stormwater Pollution Prevention will include all labor, equipment, and materials as needed to complete the work described in this section. Payment for Erosion Control/Stormwater Pollution Prevention will be measured on a lump sum unit basis at the unit price shown on the bid form. Measurement for the lump sum item of Erosion Control/Stormwater Pollution Prevention will be estimated percent completed.

10.2. Stockpiled Materials Management Areas

The Contractor shall construct stockpiled materials management areas for temporary stockpiling of contaminated soil and material generated as part of Site preparation, demolition, excavation, and other activities that may be contaminated and that will require characterization prior to off-site disposal. Material that requires temporarily stockpiling includes, but is not limited to, the following:

- Soil excavated with contaminant concentrations greater than Site cleanup levels; and
- The component of Site vegetation resulting from clearing and grubbing that includes roots and Site soil.

These materials will be temporarily stockpiled in the material management areas to allow sampling and analysis by the Engineer and characterization of the material for off-site disposal.

Stockpiled materials management areas will be constructed in accordance with the requirements of this section as well as in accordance with the construction SWPPP (Attachment 5) to prevent contaminant releases to soil and water from the stockpiled material. The stockpiled material management areas will be constructed of Ecology blocks and lined with an impermeable barrier. Stockpiled material will be covered and secured from wind, rain, and other disturbances to control dust, erosion, and contact with stormwater.

Excavated materials containing Site soil generated during clearing and grubbing (i.e., vegetation roots with soil) and each individual excavation (i.e., contaminated soil excavation areas and utility corridors) will be stockpiled separately and characterized for disposal. Depending on the results of characterization, the contaminated material will be loaded from the stockpiled materials management areas into containers and/or trucks for off-site disposal at a Subtitle D or Subtitle C landfill approved by the Engineer.

The unit cost for work performed for Stockpiled Materials Management Areas will include all labor, equipment, and materials as needed to complete the work described in this section. Payment for Stockpiled Materials Management will be measured on a lump sum unit basis at the unit price shown on the bid form. Measurement for the lump sum item of Stockpiled Materials Management Areas will be estimated percent completed.

10.3. Water Management and Disposal

The Contractor shall manage all water generated during the work performed at the Site. Water requiring management by the Contractor shall include, but is not limited to, the following:

- Stormwater runoff collected at the Site;
- Water resulting from runoff of dust control water; and
- Water generated as part of vehicle and equipment decontamination.

All water generated during Project work shall be collected and discharged to the completed remedial excavation for infiltration in accordance with the requirements of this section and as allowed by Ecology in the exemption from the Construction Stormwater General Permit described in Section 6.3.1.

The Contractor shall perform the following as well as other work, as necessary, as part of water management and disposal:

- Provide a Water Management Plan for water collection, and discharge that identifies the equipment and procedures to be used to control, collect, and transfer all water generated during the work to meet or exceed the requirements of the contract. This plan shall be submitted to the Engineer for review prior to initiation of the work.
- Provide a suitable water storage system to manage all of the water generated during the work.
- Provide suitable water collection, transfer, and transport equipment so that all of the water generated during the work can be transferred from points of generation within the Site to the water storage system components and to the completed remedial excavation for discharge and infiltration.
- Provide, install and remove dewatering equipment, as necessary, to complete all work. The Contractor shall provide well points, pumps, and other equipment and materials, as necessary, to dewater excavation areas including, but not limited to, remedial excavation areas, and site grading and capping areas.
- Collect all water from within the Site boundaries during all work and discharge water to the completed remedial excavation for infiltration.

The unit cost for work performed for Water Management and Disposal to mobilize components of the water collection system will include all labor, equipment, and materials necessary to transport and install as well as remove all of the components of the water collection system. Payment for Water Management and Disposal Mobilization will be measured on a lump sum unit basis at the unit price shown on the bid form. Measurement for the lump sum item of Water Management and Disposal Mobilization will be estimated percent completed.

The unit cost for work performed for Water Management and Disposal to operate, manage, and discharge water from the water collection system to the completed remedial excavation for infiltration will include all labor, equipment, and materials to collect, transfer, contain, maintain, transport, and discharge all water generated as part of the work as needed to complete the work described in this section. Payment for Water Management and Disposal Operations will be measured and paid for on a daily unit basis at the unit price shown on the bid form. The estimated number of days of operation is 21 (twenty one). The actual days of operation may be more or less than the estimated amount. The Contractor shall be paid based on the actual days of operation at the unit price shown on the bid form.

11.0 DEMOLITION

11.1. Utility Protection

The Contractor shall locate all utilities present within and adjacent to the work area prior to any work that includes Site preparation, clearing, grubbing, excavation or any other activity that will disturb Site soil, structures, or other Site features that could damage existing Site utilities. The Contractor is responsible for field-locating all existing utilities and shall use all appropriate methods to locate utilities present at the Site. Such methods may include, but are not limited to, subcontracting for utility locating services and potholing using safe-dig techniques (i.e., use of an air knife) prior to beginning work.

Any utilities in the vicinity of the remedial excavation area will be protected, as necessary, by the Contractor prior to and/or during excavation activities. The Contractor shall also be responsible for notifying the appropriate agencies at least two days prior to conducting excavation activities in the immediate vicinity of utilities.

The work performed for Utility Protection will be incidental to other work that is performed as part of the Aladdin Plating Site Remediation Project.

11.2. Clearing and Grubbing

The Contractor shall clear and grub all areas to facilitate completion of the Site work. The Contractor shall confirm the location and quantity of all clearing and grubbing at the Site prior to submitting a bid for the Aladdin Plating Site Remediation Project.

Above ground components of Site vegetation will be segregated from components of Site vegetation that are in contact with or contain Site soil. The above ground components of Site vegetation, including the cottonwood trees present in the central portion of the Site will be removed, reduced in size as necessary, and managed in a manner to minimize contact with Site soil and segregated from other materials generated as part of Site work. The above ground components of vegetation, including the cottonwood trees, will be transported off site and disposed of as land clearing debris in accordance with the specifications in Section 12.

Roots, stumps, or any other component of Site vegetation in contact with Site soil will be removed and reduced in size as necessary, temporarily stockpiled in a stockpiled materials management area separate from other materials generated by Site work, and sampled by the Engineer to characterize the material for off-site disposal. The component of Site vegetation in contact with Site soil will be stockpiled separately and transported off site by the Contractor to a disposal facility approved by the Engineer in accordance with the specifications in Section 12.

The work performed for Clearing and Grubbing will include all labor, equipment, and materials as needed to remove, size as necessary, segregate, and stockpile the above ground components of vegetation and the components of Site vegetation in contact with or that contain Site soil to complete the work described in this section. Payment for Clearing and Grubbing will be measured on a lump sum unit basis at the unit price shown on the bid form. Measurement for the lump sum item of Clearing and Grubbing will be estimated percent completed.

Measurement and payment for the work performed to transport and dispose of the material generated as part of Clearing and Grubbing is described in Section 12.

11.3. Monitoring Well Decommissioning

The Contractor shall coordinate the decommissioning of monitoring wells MW-1s, MW-2s, MW-3s, and MW-4s/4d that are present at the Site as shown on Sheets S-04 and S-05. The monitoring wells will be decommissioned by a driller licensed in the State of Washington in accordance with the Regulation and Licensing of Well Contractors and Operators (Chapter 173-162 WAC). The monitoring wells will be protected from damage prior to decommissioning.

The well logs for the wells that are to be decommissioned are provided in Attachment 4. The wells will be decommissioned in accordance with the requirements of the Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 WAC). The Contractor shall provide the Engineer with monitoring well decommissioning documentation prepared by the licensed driller.

The unit cost for work performed for Monitoring Well Decommissioning will include all labor, equipment, and materials as needed to decommission the existing monitoring wells, and dispose of any resulting debris to complete the work described in this section. Payment for Monitoring Well Decommissioning will be measured on a lump sum unit basis at the unit price shown on the bid form. Measurement for the lump sum item of Monitoring Well Decommissioning will be estimated percent completed.

Any debris generated as a result of work performed for Monitoring Well Decommissioning will be managed and disposed of in accordance with the specifications in Section 14.

12.0 REMEDIAL EXCAVATION AND BACKFILL

Remedial excavation shall be performed where contaminant concentrations are greater than Site cleanup levels. Material will be excavated from the remedial excavation area as shown on Sheet S-05. Excavation is estimated to include removal of approximately 680 in-place tons. The actual quantities of excavated material to be removed may be greater or less than estimated based on the results of field screening and verification sampling at the remedial excavation limits.

The Contractor shall initially excavate to the limits shown on Sheets S-05 and S-06 and notify the Engineer. The Engineer will observe the limits of the excavation areas to determine whether additional excavation is warranted based on visual observation of contamination. The Engineer will provide the Contractor direction if additional excavation is warranted based on visual observation of contamination. Upon completion of excavation of the remedial excavation based on visual observation of contamination, the Engineer will sample the remedial excavation sidewalls and bottom. The samples will be submitted by the Engineer to a laboratory for chemical analysis. The Engineer will inform the Contractor when the limits of the remedial excavations have been reached, based on the results of chemical analyses of sidewall and bottom samples collected from the limits of the excavations. The Contractor shall survey the final horizontal and vertical limits of the excavations and backfill the excavations after receiving approval from the Engineer.

The following sections include the methods and procedures for excavation, verification sampling, and backfilling and compaction of backfill materials.

12.1. Remedial Excavation

The Contractor shall perform the remedial excavation using commonly available excavation methods. The Contractor's excavation procedures shall include the following:

- The Contractor shall locate all utilities present in the vicinity of the remedial excavation areas prior to any work that could damage existing Site utilities. The Contractor is responsible for field-locating all existing utilities and shall use all appropriate methods to locate utilities present at the remedial excavation areas. Such methods may include, but are not limited to, subcontracting for utility locating services and potholing using safe-dig techniques (i.e., use of an air knife) prior to beginning work.
- The Contractor shall complete clearing and grubbing in the remedial excavation areas, including, but not limited to, demolition of the asphalt pavement access road and removal of the gravel base course prior to initiation of remedial excavation activities.
- The Contractor shall stake the remedial excavation boundaries shown on Sheet S-05 prior to excavation activities and protect and preserve the survey stakes during the work.
- The Contractor shall initially excavate materials to the horizontal and vertical limits shown on Sheets S-05 and S-06 and stockpile the materials from each area separately in stockpiled materials management areas. The excavation sidewalls shall not initially be sloped unless required to meet WISHA or OSHA requirements. The Engineer will observe excavation activities and provide guidance on excavated material segregation within the stockpiled materials management areas.
- The Contractor shall be solely responsible for excavation slope stability. Excavation work shall be performed in compliance with applicable regulations and in accordance with the Contractor's HASP.
- If necessary, the Contractor shall provide all materials, labor and equipment necessary to shore remedial excavations to protect the work, existing property, utilities, pavement, and any other structures and to provide safe working conditions in the excavation as per WSDOT Standard Specification 7-08.3(1)B and in compliance with applicable local, state or federal safety codes. Shoring plans will be submitted to the Engineer for review before any shoring is installed. Damage resulting from improper shoring or failure to shore shall be the sole responsibility of the Contractor.
- The Contractor shall be aware that the surface and subsurface at the Site consists of fill materials including, but not limited to, soil and gravel.
- Prevent odors and generation of dust or loss of materials during remedial excavation in accordance with the City's ordinance(s) or as directed by the Engineer.
- Prevent cross-contamination and re-contamination of remediated areas and any portion of the Site outside the remedial excavation areas. At the determination of the Engineer, the Contractor shall excavate any cross-contaminated and/or re-contaminated material at the Contractor's expense.
- Support any structures or active utilities adjacent to remedial excavation areas, as necessary, during excavation activities to prevent damage to any structure or utility, or unsafe working conditions. Damaged structures, utilities, or other facilities shall be repaired or replaced at the Contractor's expense as determined by the Engineer.
- Where excavation of materials in the vicinity of any existing active utilities proves to be exceedingly hazardous, utilize safe dig technologies (air knife, vacuum truck potholing, etc.) to the extent practicable.

- Allow and provide safe access to the Engineer for observation during remedial excavation work. Excavate additional materials beyond the horizontal and/or vertical limits shown on Sheets S-05 and S-06, if there are visual observations indicating that soil at the limits of the remedial excavations is contaminated and stockpile with previously excavated and stockpiled material from the same location. The Contractor shall perform this additional excavation only as directed by the Engineer.
- Allow and provide safe access to the Engineer for collection of samples during remedial excavation work. Assist the Engineer in obtaining samples from the sidewalls and base of remedial excavation areas during the excavation whenever exposed areas of the excavation are not readily accessible for such sampling activities. Excavate additional materials beyond the horizontal and/or vertical limits shown in Sheets S-05 and S-06, if the verification sample analysis results indicate that soil at the limits of the remedial excavation(s) exceed the cleanup levels and stockpile with previously excavated and stockpiled material from the same location. The Contractor shall perform this additional excavation only as directed by the Engineer. The Contractor shall be responsible for costs associated with over-excavation in areas beyond those specified if those areas are not first approved for additional excavation by the Engineer.
- If water is encountered in a remedial excavation, the contractor shall remove, control, and store the water prior to discharge for infiltration according to the requirements in Section 10.3.
- The Contractor shall not backfill the remedial excavation areas until the areas have been approved by the Engineer for backfill. Conditions to be achieved for backfill approval include, but are not limited to, achieving the total depth and horizontal extent of contaminated material removal based on visual observation and completion of verification sampling and analysis, and receipt of analytical results indicating that the material in the excavation sidewalls and bottom meet the cleanup levels.
- Material that is removed from each remedial excavation area shall be temporarily stockpiled on site for disposal characterization and shall be contained in separate, stockpiled materials management areas in accordance with the specification in Section 10.2.

The unit price for work performed for Remedial Excavation will include all labor, equipment, and materials as needed to complete the work described in this section. Payment for Remedial Excavation will be measured on a per ton unit basis at the unit price shown on the bid form. Measurement for the per ton item of Remedial Excavation will be based on the original weight tickets provided by the approved disposal facilities receiving the excavated material. The weights for measurement of the per ton item of Remedial Excavation will be from certified commercial scales. The estimated quantity of soil to be excavated as part of Remedial Excavation is 680 tons. The actual quantity of soil that is excavated may be more or less than the estimated quantity. The Contractor shall be paid based on the actual quantity of excavated tonnage at the unit price shown on the bid form.

Measurement and payment for the work to load, transport, and dispose of material generated as part of Remedial Excavation is described in Section 13.

12.2. Remedial Excavation Verification Sampling and Analysis

Remedial excavation verification sampling will be performed by the Engineer with assistance, as necessary, from the Contractor. Remedial excavation verification sampling will involve collecting soil samples from the base and sidewalls of the remedial excavations after visual observations indicate that contaminated soil has been removed from the excavations to verify that the Site cleanup levels have been achieved. If a sample collected from an excavation sidewall or from the base of the excavation contains contaminant concentrations greater than the Site cleanup levels, additional excavation will be performed to remove soil with contaminant concentrations greater than the cleanup levels and additional verification samples will be collected from the excavation sidewall and base, as appropriate, to confirm the completeness of the contamination removal. Discrete verification samples will be collected by the Engineer from the limits of the remedial excavations at the sampling frequency described in CMP provided in Attachment 1.

The Contractor shall be prepared to coordinate with the Engineer to complete remedial excavation verification sampling and analysis to remove soil with contaminant concentrations greater than Site cleanup levels. The Engineer will perform sampling and analysis of the soil in accordance with the sampling and frequency requirements of the CMP (Attachment 1). The Contractor is notified that analysis of the soil samples will take up to seven (7) days to complete. No additional payment or claims of delay or other damages shall arise based on coordination to complete remedial excavation, verification sampling and analysis.

12.3. Backfilling and Compaction of Remedial Excavation Area

The Contractor shall backfill the remedial excavation area to the elevations shown on Sheet S-05 upon completion of remedial excavation activities and approval by the Engineer. Backfill material will be composed of imported bank run sand and gravel material necessary to complete backfilling the remedial excavation areas. Any imported backfill material shall meet the testing requirements described in the CMP (Attachment 1). The remedial excavations will be backfilled as follows:

- The Contractor shall place backfill material into a remedial excavation only after receiving the Engineer’s approval.
- The Engineer must approve any imported backfill material source(s) based on source inspections and chemical and physical testing. If the Contractor places the backfill without the Engineer’s approval, the Contractor shall remove the remedial excavation backfill material from the Site and dispose of the material off site at a permitted off-site facility at the Contractor’s expense.
- The Contractor shall identify all sources of imported backfill material anticipated to be used on the Project in the pre-construction meeting. The Contractor shall also provide at the pre-construction meeting, the results of grain-size distribution (ASTM D 422) and modified Proctor (ASTM D 1557) tests on the proposed imported remedial excavation backfill material from the identified sources. The Engineer will perform an inspection of the remedial excavation backfill material sources and collect samples to chemically characterize backfill material. The backfill material samples collected by the Engineer will be submitted for chemical analyses in accordance with the CMP (Attachment 1) to demonstrate that the backfill is free from contamination. The results of the chemical analyses will be reviewed by the Engineer to determine whether the backfill material meets the MTCA unrestricted land use criteria. Chemical analysis of the remedial excavation backfill shall be performed on the material prior to the Contractor importing the material to the Site.
- The Engineer will notify the Contractor of the results of review of physical and chemical analyses. If the proposed imported remedial excavation backfill is not free from contamination or grain-size or modified Proctor tests do not meet the requirements described in the Contract Documents, the Contractor shall propose a new source of backfill material and provide grain-size and modified Proctor tests for the proposed remedial excavation backfill material. The Engineer will be required to perform an inspection of any additional remedial excavation backfill material sources not previously identified and collect samples to chemically characterize the backfill material. No increase in the unit rate will be afforded to the Contractor based on the Contractor’s source(s) not meeting the requirements of the project Contract Documents.

- The Contractor shall backfill the remedial excavation to the lines and grades as indicated on Sheet S-05, with the following backfill material;
    - Where the base of the remedial excavation is determined to be in a firm and unyielding condition by the Engineer, place bank run gravel material. The bank run gravel material shall meet the following requirements: 100 percent of the material passing a 4-inch opening and shall not have greater than 6 percent by weight passing a U.S. No. 200 standard sieve (WSDOT Specification 9003.14). The material shall be free of various types of wood waste or other extraneous or objectionable materials.
    - Where the base of the remedial excavation is determined to be unsuitably soft by the Engineer, place quarry spalls to stabilize the remedial excavation base for placement of backfill material composed of bank run gravel. Quarry spalls shall meet the following requirements for grading: Sieve Size Percent Passing 8-inch – 100 percent; 3-inch – 40 percent maximum; ¾-inch – 10 percent maximum. Ballast material shall consist of crushed, partially crushed or naturally occurring granular material in accordance WSDOT Standard Specification 9 03.9(1). Geotextile material shall meet Section 9-33 (9-33.2(1), table 3), Soil Stabilization Geotextile.
- Place the remedial excavation backfill materials in maximum loose lifts of 1 foot and compact to at least 95 percent maximum dry density (MDD) as determined by ASTM D 1557. The Engineer will observe backfill operations so that the backfill meets the requirements in these Contract Documents. Field density testing shall be completed by the Engineer at a frequency determined by the Engineer.
- Perform general Site grading such that the finished surface of the remedial excavation backfill material matches the existing ground elevations at the excavation limits.
- Prevent the generation of dust or loss of materials during remedial excavation backfilling and grading and provide dust control, as necessary.
- Coordinate with survey crews to record the final surface elevation of completed remedial excavation backfilling and grading corresponding to NAD 1983. The survey shall be conducted by a Washington State licensed surveyor.

The unit cost for Backfill and Compaction of Remedial Excavation Area for each imported remedial excavation backfill material shall include all labor, equipment, delivery, handling, placement and compaction. Payment for Remedial Excavation for each imported remedial excavation backfill material will be measured on a per ton unit basis at the unit price shown on the bid form. Measurement for the per ton item of Backfill and Compaction of Remedial Excavation Areas for each imported remedial excavation backfill material will be based on the original weight tickets provided by the backfill material supplier. The weights for measurement of the per ton item will be from certified commercial scales. The Contractor shall supply the import material load weight tickets upon delivery for project tracking purposes. Failure to supply import load tickets will result in holding monthly progress payment in lieu of compliance. The estimated quantity of imported backfill material for the remedial excavation area is the following:

- 800 tons of bank run gravel (assuming unit weight conversion at 2 tons per cubic yard)

The actual quantities of imported backfill material for remedial excavation backfill and compaction may be more or less than the estimated quantities. The Contractor shall be paid based on the actual tonnage of each material at the unit prices shown on the bid form.

13.0 MATERIAL MANAGEMENT, LOADING, TRANSPORT, AND DISPOSAL OR RECYCLING

The Contractor shall manage, load, transport, and dispose of or recycle materials generated as part of the work including the following;

- Vegetation resulting from clearing and grubbing; and
- Soil and debris resulting from remedial excavations.

The material generated from the work will be segregated and disposed of or recycled based on the type and source of the material as well as sampling and chemical analysis for some materials. Table 3 summarizes the types and sources of material to be generated as part of the work, the specified methods of material management, and method of disposal or recycling.

Vegetation resulting from clearing and grubbing includes above ground components of brush and trees as well as below ground components comprised of roots and stumps in contact with or containing Site soil. The above ground components of Site vegetation that are removed and segregated from other materials generated as part of the work in accordance with the specifications in Section 11.2 will be loaded and disposed of off site as land clearing debris at a facility approved by the Engineer. No additional payment will provided for transport of light loads.

The component of Site vegetation that is in contact with or contains Site soil removed and stockpiled in a stockpiled materials management area in accordance with the specifications in Section 11.2, will be sampled by the Engineer to characterize the material for off-site disposal and loaded and transported off site by the Contractor to a disposal facility approved by the Engineer based on the results of the material sampling and analysis. The component of Site vegetation that is in contact with or containing Site soil will be disposed of at a Subtitle D or Subtitle C landfill based on the results of material sampling and analysis.

Soil and debris generated as part of clearing and grubbing, and remedial excavations will initially be segregated from each other and other materials generated as part of the work in accordance with the specifications in Sections 11.2 and 12.1 to allow for the individual characterization of material excavated from each area. The material generated during excavation, including any debris removed from each area, that is temporarily placed in stockpiled materials management areas in accordance with the specifications in Sections 11.2 and 12.1, will be sampled by the Engineer to characterize the material for off-site disposal, and loaded and transported off site by the Contractor to a disposal facility approved by the Engineer based on the results of the material sampling and analysis. Soil and debris may be transported off site in combination with other soil and debris or other materials of similar characterization that is being disposed of at the same landfill. No additional payment will provided for transport of light loads.

The Engineer will collect samples from each stockpile in accordance with the procedures specified in the CMP (Attachment 1) and submit the samples to a chemical analytical laboratory for analysis. The results from stockpile sampling and analysis will be compared to landfill disposal criteria by the Engineer to identify the appropriate disposal location. The Engineer will transmit the sample results to the landfill for authorization and acceptance of the stockpiled material for disposal. Upon receipt of authorization and acceptance for disposal, the Contractor shall load and transport the stockpiled material to the landfill for disposal and provide the documentation of disposal to the Engineer. Sampling and analysis, comparison of the sample results to landfill criteria, and acceptance of the stockpiled material by the landfill will be performed/obtained prior to loading and transport of any stockpiled material off site for disposal by the Contractor.

Based on the results of the stockpiled material sampling and analysis, the stockpiled material will fall into two categories: (1) non-dangerous, solid waste, suitable for disposal at a Subtitle D landfill or (2) Hazardous/Dangerous waste to be disposed of at a Subtitle C landfill. Based on the existing data, approximately 170 tons is anticipated to be classified as Hazardous/Dangerous waste and will be disposed of at a Subtitle C landfill approved by the Engineer. Soil designated as a Hazardous/Dangerous waste will be managed and transported by the Contractor in accordance with the Washington State Dangerous Waste Regulations (WAC 173-303). It is anticipated that approximately 510 tons will be classified as non-dangerous, solid waste that will be disposed of at a Subtitle D landfill approved by the Engineer.

The Contractor shall identify the facilities to be used to dispose of materials generated by the work during the pre-construction meeting. The facilities will be verified by the Engineer and approved by Ecology. In preparation for the Aladdin Plating Site Remediation Project, draft waste profiles have been submitted for disposal of soil and debris to be stockpiled and characterized prior to disposal and preliminary authorizations for disposal have been received from the following Subtitle D and Subtitle C landfills:

- Republic Services Roosevelt Regional Municipal Solid Waste Landfill (Subtitle D) located in Roosevelt, Washington; and
- Chemical Waste Management Landfill (Subtitle C) located in Arlington, Oregon.

The draft waste profiles and preliminary authorizations are provided in Attachment 6.

The Contractor can choose to utilize the landfills for which preliminary authorizations have been received for disposal of soil and debris to be stockpiled and characterized prior to disposal, that are identified above, or can identify different landfill facilities for disposal of the stockpiled material.

If the Contractor identifies a different disposal facility, the facility must be a Subtitle D or Subtitle C Landfill, at a minimum, and it's permitting and operations must meet all federal, state, and local regulations for disposing of waste materials. If the Contractor elects to choose a disposal facility other than the facilities that have provided preliminary waste authorizations as identified in these Contract Documents, any costs incurred by the Contractor to perform testing for waste material acceptance, prepare submittals for waste profiling, waste disposal authorization, or any other approvals, and any other additional costs associated with disposal at the Contractor's selected facility shall be at the Contractor's expense and not borne by the contracting agency. Any facility selected by the Contractor must be approved by the Engineer prior to use.

The Contractor shall perform the following to dispose of the material generated as a result of the work:

- Provide and coordinate all off-site transportation of material identified in these Contract Documents and any additional material as directed by the Engineer to a disposal facility approved by the Engineer.
- Manage and transport material designated Hazardous/Dangerous waste in accordance with Dangerous Waste regulations (Chapter 173-303 WAC).
- Load the material into appropriate containers and/or trucks for transport to the appropriate disposal facility/facilities.
- Wet material will be allowed to drain and water collected in the Site water storage system prior to loading and transport to the selected disposal facility/facilities so the material meets the disposal requirements of the facility/facilities. Collected water will later be tested for chemical conditions prior to subsequent discharge.

- Prevent the generation of dust or loss of material from containers and/or trucks used to transport the material to prevent contamination of areas outside of the Site. Cover containers and/or trucks prior to leaving the Site to prevent loss of the material during transport. Line containers and/or trucks, if necessary, to prevent loss of excavated material and any free liquids from transport containers and/or trucks. Any material released by the Contractor outside of the Site shall be cleaned up at the Contractor's sole expense.
- Unload the material at the approved disposal facility.
- Provide original waste manifests, weight tickets, and disposal receipts from the approved disposal facility that identifies the disposal facility, waste material hauler (i.e., company, truck identification, driver, etc.), date of transport, and weight of material transported.

The unit cost for work performed for Material Management, Loading, Transport, Disposal, or Recycling will include all labor, equipment, and materials as needed to manage, load, transport, and dispose of materials, including disposal fees (i.e., tipping fees), generated as part of the work described in this section. Payment for Material Management, Loading, Transport, or Disposal will be measured on a per ton unit basis at the unit prices shown on the bid form. Contractor is notified that material to be disposed of includes wood and other organic material. No additional payment shall be provided for transporting of light loads. Measurement for the per ton item of Material Management, Loading, Transport, or Disposal will be based on the original weight tickets provided by the approved disposal facilities receiving the material. The weights for measurement of the per ton item of Material Management, Loading, Transport, or Disposal will from certified commercial scales. Original disposal weight tickets will be supplied to the Engineer two days after material disposal for project tracking purposes and monthly progress payment evaluation. Monthly progress payments will be held in lieu of Engineer receiving disposal weight tickets for payment period. The estimated quantities of materials requiring loading, transport, and disposal are the following:

- 1 ton of land clearing debris
- 510 tons of Subtitle D landfill material
- 170 tons of Subtitle C landfill material

The actual quantity of material requiring loading, transport, disposal, or recycling may be more or less than the estimated quantity. The Contractor shall be paid based on the actual tonnage of each material at the unit prices shown on the bid form.

14.0 SITE RESTORATION

The Contractor shall perform Site restoration work following the completion of backfill and compaction of the remedial excavation area. Site restoration work shall be performed in accordance with the requirements of this section and as shown on Sheet S-05.

The Contractor shall maintain all temporary erosion and sediment control facilities, including the water collection and treatment system, until the Site has been fully stabilized and the Site restoration has been accepted by the Engineer and Owner.

Any damages to property and structures including, but not limited to, adjacent property, utilities, driveways, sidewalks, pavement buildings, landscaping, vehicles or City rights-of-way (ROWs) caused by the Contractor during the work, will be restored at the Contractor's expense during Site restoration. The Contractor shall prevent cross-contamination and/or re-contamination of capped areas during Site restoration activities. At the determination of the Engineer, the Contractor shall excavate any cross-contaminated and/or re-contaminated material at the Contractor's expense.

14.1. Groundwater Monitoring Well Installation

The Contractor shall coordinate the installation of new, replacement monitoring wells at the locations shown on Figure 3. Drilling and construction of the monitoring wells will be performed by a Washington State licensed driller in accordance with the Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 WAC) and observed by a licensed geologist. The monitoring well borings will be drilled using a hollow-stem auger drill rig. The monitoring wells are to be installed to depths between approximately 30 and 40 feet bgs. The Engineer will provide a licensed geologist to monitor and log the borings and well installation. Soil cuttings from the borings completed for installation of the monitoring wells will be placed in labeled and sealed 55 gallon drums. The drums will be stored temporarily at a secure location on the Site pending off-site disposal at a permitted disposal facility approved by the Engineer.

The monitoring wells will be constructed of 2-inch-diameter, flush-threaded, schedule 40 polyvinyl chloride (PVC) casing with machine-slotted PVC screen (0.010-inch). The screened interval will be 10-feet in length. A filter pack will be installed around the well screen from the bottom of the well to 1 foot above the top of the well screen. The filter pack material will consist of commercially prepared 10-20 silica sand. A bentonite annular seal will be placed above the sand pack to a depth of approximately 1 foot bgs. Each well will be completed with a concrete surface seal and a flush-mount monument. The monument will be cemented in place from the surface to a depth of approximately 1 foot bgs.

The unit cost for work performed for Groundwater Monitoring Well Installation will include all labor, equipment, and materials as needed to complete the work described in this section. Payment for Groundwater Monitoring Well Installation will be measured on a lump sum unit basis at the unit price shown on the bid form. Measurement for the lump sum item of Groundwater Monitoring Well Installation will be estimated percent completed.

14.2. Fencing Restoration

The Contractor shall, to the extent practicable and necessary, restore Site fencing using existing chain-link fencing, gate materials, and hardware that were present during Site preparation activities. The Contractor shall reinstall Site fencing in in accordance with the details shown on Sheets S-04 and S-05.

The unit cost for work performed for Fencing Restoration will include all labor, equipment, and materials as needed to complete the work described in this section. Payment for Fencing Restoration will be measured on a lump sum unit basis at the unit price shown on the bid form. Measurement for the lump sum item of Fencing Restoration will be estimated percent completed.

14.3. Demobilization and Cleanup

The Contractor shall, upon completion of all other Site restoration requirements, remove and demobilize all remaining equipment and materials at the Site, and conduct cleanup of adjacent rights-of-way and properties affected by remediation and restoration activities. Cleanup will include, but not be limited to, removal of debris, street and sidewalk sweeping, and dust control.

The unit cost for work performed for Demobilization and Cleanup will include all labor, equipment, and materials as needed to complete the work described in this section. Payment for Demobilization and Cleanup will be measured on a lump sum unit basis at the unit price shown on the bid form. Measurement for the lump sum item of Demobilization and Cleanup will be estimated percent completed.

15.0 COMPLIANCE MONITORING

Compliance monitoring will be implemented by the Engineer in accordance with WAC 173-340-410 and the CMP provided in Attachment 1. The three types of compliance monitoring to be performed include:

- Protection Monitoring to confirm that human health and the environment are adequately protected during the work performed as part of the Aladdin Plating Site Remediation Project.
- Performance Monitoring to confirm that the work has attained cleanup standards.
- Confirmational Monitoring to confirm the long-term effectiveness of the cleanup action.

Protection monitoring is addressed in the HASPs prepared for the work. A HASP is included as an appendix to the CMP (Attachment 1). Performance and confirmational monitoring requirements are presented in the CMP.

16.0 QUALITY ASSURANCE/QUALITY CONTROL

This section describes general quality assurance/quality control (QA/QC) procedures to be implemented during the Aladdin Plating Site Remediation Project, including contractor quality control, construction monitoring, and field documentation, and analytical QA/QC. Details regarding analytical QA/QC are presented in the Quality Assurance Project Plan (QAPP), included in the CMP (Attachment 1).

16.1. Contractor Quality Control

The Contractor shall prepare a Construction Quality Assurance Plan before commencing work. The plan will be subject to review and approval by Engineer to ensure that the planned actions are in accordance with the contract requirements. The Construction Quality Assurance Plan will include plans for each of the primary elements of work and the quality control procedures to be implemented as part of the work. The quality control plan will address the following:

- Quality control organization;
- Quality control methods and procedures;
- Documentation of the methods and procedures;
- Corrective actions when QC and/or acceptance criteria are not met; and
- Any additional elements that the contractor deems necessary to adequately control work processes required by the contract.

The Contractor shall maintain QC records. These records will include evidence that quality control procedures, inspections or tests have been performed, including the type and number of inspections or tests involved; results of inspections or tests; nature of quality control deviations, causes of deviations, and corrective actions taken.

The work performed for Contractor Quality Control shall be incidental to other work that is performed by the Contractor.

In addition to the Contractor's quality assurance plan, the Engineer on behalf of Ecology will perform oversight of the contractor's activities.

16.2. Construction Monitoring and Field Documentation

Construction monitoring will be performed by the Engineer. A comprehensive record of field activities will be maintained. Field documentation for this project will include field notes, field forms, field reports, and chain-of-custody forms for samples submitted for analytical testing. The field documentation will record construction, sampling, and monitoring activities, sampling personnel, and weather conditions, as well as decisions, corrective actions, and/or modifications to the project plans and procedures specified in this EDR.

16.3. Analytical QA/QC

Analytical QA/QC is described in the QAPP provided in the CMP (Attachment 1). The QAPP describes soil and water sampling, analysis, and QC procedures that will be implemented to produce chemical and field data that are representative, valid, and accurate for use in evaluating the effectiveness of the cleanup action.

17.0 HEALTH AND SAFETY

The work completed as part of the American Plating Site Remediation Project will be performed in accordance with the requirements of the Washington Industrial Safety and Health Act (RCW 49.17) and the Federal Occupational Safety and Health Act (29 CFR 1910, 1926). These regulations include requirements that workers are to be protected from exposure to contaminants.

The Contractor shall be solely and completely responsible for property conditions and safety during the term of the Contract. This obligation shall include the safety of all persons within or affected by the Contractor's limits of work and all private property affected by the work. The work performed by the Contractor for health and safety shall be incidental to other work that is performed by the Contractor.

The Contractor shall prepare a project-specific HASP for review by the Engineer prior to initiating work at the Site. The Engineer may provide noted exceptions after review of the Contractor's HASP, but the Engineer will not approve or be liable for the Contractor HASP.

The Contractor shall give a "clear and reasonable warning" to its employees and the general public for any workplace or environmental exposure that results from its activities during the course of this project.

17.1. Contractor's Responsibility for Health and Safety

The Contractor's responsibility for health and safety shall include, but is not limited to, the following:

- The Contractor shall comply with any and all state and local ordinances and regulations.
- The Contractor shall have a duty of responsibility for the health and safety of Contractor's employees, its subcontractors, suppliers, agents, inspectors, visitors, the general public and any others associated with or interacting with the Contractor to provide labor, goods or other services on the job site.
- The Contractor shall be responsible for emergency response planning and notification and for actual response to any and all emergencies that may occur during the course of the work.
- The Contractor is responsible for communicating daily with the Engineer regarding health and safety issues for the Engineer's safe conduct of the Engineer's duties, but such communication shall not imply any duty or responsibility on the part of the Engineer with regard to health and safety of the Contractor's employees, its subcontractors, suppliers, the general public or others. The Engineer's responsibility and duty with regard to health and safety shall be limited to the Engineer's employees. The Contractor shall have responsibility and duty to the Engineer to communicate health and safety issues accurately and in a timely manner to allow the Engineer to take appropriate actions to protect the Engineer's employees.
- The Contractor is responsible for understanding and acting in accordance with all requirements of this Section and the Contractor's HASP for the project.
- The Contractor shall designate a dedicated Contractor's Site Safety and Health Officer (SSHO) on the Site during the work that shall, at a minimum, have at least three years of experience as a SSHO on remediation projects similar to the current project and have 40-hour OSHA Hazardous Waste Operations training and 8-hour OSHA Hazardous Waste Supervisor training. Tenure of the Contractor's SSHO shall be subject to approval by the Engineer.
- The SSHO shall be present on site during all Contractor activities and working hours and shall enforce the requirements of safety for all Contractor personnel on site at all times. The SSHO shall ensure that all Contractor and its subcontractor personnel working at the Site, and Contractor visitors, follow the HASP, including wearing the designated level of personal protective equipment (PPE). If the SSHO elects to require a higher level of protection than that specified in the HASP, the extra costs associated with such higher level shall be borne by the Contractor, unless such extra costs are approved in advance in writing by the Engineer.
- Prior to mobilization and continually through the duration of the work, the SSHO shall inspect the Site and document area-specific and worker-specific protection requirements.
- After mobilization, the SSHO shall monitor activities and shall document the need for additional worker protection as required, based on activities performed and action levels specified in the HASP.
- The SSHO shall verify that all activities are performed in accordance with the Contractor's HASP and all federal, state, local, and health and safety standards, regulations and guidelines.
- In the event of a health and/or safety risk as determined by the SSHO or other Contractor personnel, or as determined by the Engineer, the Contractor shall not proceed with the work until a method for handling the risk has been determined in consultation with the Engineer and implemented. Any health or safety risk resulting in a stoppage of work shall be reported immediately to the Engineer.

17.2. Contractor's Health and Safety Submittals

The Contractor shall prepare and submit a HASP to the Engineer. The Contractor shall follow all applicable local, state and federal health and safety standards and guidelines implemented through, but not limited to, the OSHA, WISHA, NIOSH, ACGIH and EPA. Where these are in conflict, the most stringent requirement shall be followed. The following points shall be addressed in the Contractor's HASP:

- Names of key personnel with contact numbers and alternates responsible for health and safety, including a Contractor Health and Safety Representative and SSHO.
- A Safety Task Analysis Review (STAR) or Job Safety and Hazard Analysis (JSHA) associated with each portion of the Work (for example, list potential chemical and physical hazards).
- Employee and subcontractor training assignments to ensure compliance with 29 CFR 1910.120.
- A requirement that the Contractor locate underground utilities (if any) by using "Safe Dig" procedures prior to the start of the work.
- Personal protective equipment (PPE) to be used for each of the on-site tasks and operations being conducted, as required by the PPE program in 29 CFR 1910.120 and 29 CFR 1926.
- Medical surveillance requirements in accordance with the program in 29 CFR 1910.120.
- Indicate the frequency and types of air monitoring, personnel monitoring and environmental sampling techniques and instrumentation to be used by the Contractor, including methods of maintenance and calibration of monitoring and sampling equipment.
- Corrective actions and upgrading of personnel protection based on monitoring of air, personnel, and environmental sampling, with specific action levels identified.
- The on-site control measures in accordance with the control program required in 29 CFR 1910.120 and 29 CFR 1926.
- Decontamination procedures in accordance with 29 CFR 1910.120.
- An emergency response plan meeting federal, state and local requirements for safe and effective responses to emergencies, including the necessary PPE and other equipment.
- Explanation of potential emergencies and contingency plan of action, including description of the route to the nearest appropriate hospital and a hospital route map, and posting of emergency telephone numbers on site.
- A list of health and safety and emergency equipment available on site.
- A description of engineering controls used to reduce the hazards of equipment operation and exposure to on-site hazardous chemicals.
- Lockout/Tagout procedures where the operation of machinery and/or equipment in which the unexpected energization on startup or the release of stored energy could cause injury to personnel.
- Current respiratory fit testing certification.

17.3. Notifications

The Contractor shall notify the Engineer under the following circumstances:

- The Contractor shall immediately verbally report (within 30 minutes) to the Engineer the occurrence of any and all health and safety incidents. An Incident Report form or Near Miss Report form, as appropriate, shall be submitted within 48 hours of occurrence of the incident or issue.
- The Contractor shall immediately and fully investigate any such incident or near miss and conduct a root cause analysis, and shall provide to the Engineer, the Contractor's written corrective action plan for such incident within one day after the incident occurs.
- The Contractor shall notify the Engineer in writing at least 5 days prior to bringing any hazardous material, equipment or process to the job site, or using the same on site. The Contractor shall provide the Engineer with a safety data sheet (SDS) for all chemicals brought on site.
- The Contractor shall immediately notify the Engineer in writing of any hazard that the Contractor discovers or observes on site and corrective measures planned or taken to eliminate or minimize such hazard. Hazard reporting will be completed as a Near Miss Report.

17.4. Training Requirements

The Contractor shall provide the following training to each worker:

- Initial 40-hour (or 80-hour where appropriate) OSHA Hazardous Waste Health and Safety training and current annual 8-hour refresher training.
- Eight-hour OSHA Hazardous Waste Supervisory Training (required for the Contractor's Superintendent or SSHO).
- Current CPR and first aid certification for at least one worker assigned to work on site.

17.5. Work Planning and Meetings

- The Contractor shall conduct a Daily Health and Safety Meeting prior to beginning work for that day, to address health and safety issues, changing conditions, activities and personnel. All Contractor and subcontractor employees working on site on that day shall attend the meeting. All meetings shall be documented, and attendees shall sign acknowledgement of their presence at the meeting. Daily meetings will include an evaluation of the work performed that day. Meeting attendance and discussion points will be documented daily and a copy will be provided to the Engineer.
- Subcontractor personnel who are not in attendance for the Daily Health and Safety Meeting shall be briefed on the meeting notes upon arrival at the job site and prior to commencing their work activities. Employees shall sign acknowledgement of briefings prior to commencing work.
- The Contractor shall hold and document additional safety meetings at the start of each major task and whenever on-site conditions affecting personnel safety change. Any major task undertaken will require the completion of a JSHA.

17.6. Engineering Controls

The Contractor shall, at a minimum, provide the following engineering controls to reduce the hazards of equipment operation and exposure to on-site hazardous materials:

- Rollover cages for bulldozers, backhoes, loaders and tractors.
- Backup alarms for all trucks and moving equipment.
- Wetting of soil or other means to control dust during the work.
- Decontamination of personnel and equipment in accordance with these Contract Documents.
- Others as determined to be necessary or prudent by the Contractor or as determined by the Engineer.

17.7. Monitoring

The Contractor shall, at a minimum, perform the following monitoring:

- The Contractor shall maintain an appropriate air monitoring program and an industrial hygiene program, including the use of proper equipment for routine air monitoring, calibration records, air monitoring results and training personnel to assist the SSHO in these duties.
- The Contractor shall perform heat exposure and cold exposure monitoring activities as required by weather conditions.

17.8. Personal Protective Equipment (PPE)

The Contractor's PPE requirements shall include the following:

- The appropriate level of PPE shall be determined by the Contractor for specific tasks as described in the Contractor's HASP. If hazards are identified that require a level of protection greater than Level D, work shall be suspended and the Engineer notified. The Contractor's SSHO, in consultation with the Engineer, shall determine what actions are required prior to restarting work. The Contractor shall determine and document the appropriateness of suggested minimum PPE requirements for Contractor's employees and others at the job site.
- At a minimum, all personnel and visitors on site shall wear Level D PPE, except in Support Zone areas. Level D PPE consists of:
  - Hard hat.
  - Steel-toed boots.
  - Safety glasses with permanent side shields.
  - Work clothes (long pants, shirts with sleeves).
  - Orange reflective safety vests.
  - Work gloves (as required).
  - Hearing protection (as required to prevent exposure to noise exceeding 85 decibels [dB]).
- The Contractor shall furnish and maintain materials and equipment for the health and safety of Contractor employees, its subcontractors, suppliers and visitor personnel. The Contractor shall provide all required health and safety equipment, first aid equipment, tools, monitoring equipment, PPE and ancillary equipment and methods required to ensure workers' health and safety and to comply with the HASP. The Engineer will furnish PPE and monitoring for Engineer's employees.

17.9. Other Health and Safety Equipment

The Contractor is required to have the following equipment available on site for the health and safety of subcontractors, sub-subcontractors, suppliers and visitors:

- Air monitoring instruments, including (but not limited to):
  - Organic vapor meter.
  - Combustible gas indicator.
  - Dust particulate meter.
- First aid kits.
- Fire suppression equipment (appropriate to location and type of flammable materials present).
- OSHA-approved emergency eyewash facilities.
- Personnel decontamination facilities and equipment.
- Fall protection equipment.
- Other equipment or supplies as determined to be necessary or prudent by Contractor or the Engineer.

17.10. Evaluation of Performance

- The Contractor shall routinely conduct internal safety audits on the work to verify that work is being performed in accordance with the Contractor's HASP. These routine audits will focus on compliance with OSHA and WISHA safety regulations.
- The Contractor shall conduct routine behavioral observations and provide immediate feedback during work activities to promote safe behavior of Contractor employees and subcontractor employees.

17.11. Exclusion Zone Plan

The Contractor shall prepare a project-specific Exclusion Zone Plan. The plan shall locate an Exclusion Zone, a Decontamination Zone and a Support Zone. The Exclusion Zone shall contain only the activities necessary for the completion of hazardous work. The plan shall document decontamination procedures containing, at a minimum, the following information:

- Decontamination methods and equipment that will be used.
- Procedures to prevent contamination of clean areas.
- Methods and procedures to minimize worker contact with contaminants during removal of personal protective clothing and equipment.
- Procedures for decontamination of vehicles, equipment and personnel that enter the Exclusion Zone and leave the job site.
- Procedures for disposal of clothing and equipment that is not completely decontaminated.
- Procedures for the collection, treatment and disposal of all decontamination water, sludge and wastes.

The Exclusion Zone and Decontamination Zone shall be secured during nonworking hours. Access to the Exclusion Zone during working hours shall be controlled by the Contractor through a designated access point.

18.0 SCHEDULE

Pending project approvals, the work is scheduled to begin in September 2015. The construction duration is estimated to be approximately three to four weeks.

19.0 SUBMITTALS

The Contractor shall submit one (1) copy, unless otherwise noted, of the documents included in the table below in accordance with the delivery schedule. The Engineer will review the documents and if any modifications are requested, the Contractor shall submit copies of the modified documents before beginning on-site work. The required submittals and delivery dates required for these submittals are shown below. The work performed by the Contractor to prepare Contractor submittals shall be incidental to other work that is performed by the Contractor.

CONTRACTOR SUBMITTALS

Submittal	Delivery Schedule
Project Work Plan and Schedule (list of planned subcontractors, documentation of insurance, sequence of work, materials management, property layout, construction schedule including milestones, etc.) – three copies	Pre-construction conference
Imported Backfill and Capping Material Sources and Grain Size and Modified Proctor Test Results	Pre-construction conference
Water Management Plan – three copies	Pre-construction conference
Disposal and Recycling Facilities (company name, disposal facility and location)	Pre-construction conference
Contractor Health and Safety Plan (HASP) – three copies	Pre-construction conference
Construction Stormwater Pollution and Prevention Plan (SWPPP) and Temporary Erosion and Sediment Control Plan (TESC) – three copies	Pre-construction conference
Construction Spill Control and Countermeasure Plan (SPCC) – three copies	Pre-construction conference
Contractor Quality Assurance Plan – three copies	Pre-construction conference
Exclusion Zone Plan (plans and procedures to maintain secure exclusion zone) and traffic control plan – three copies	Pre-construction conference
Monitoring Well Decommissioning Documentation	Five days after decommissioning activities
Topographic Survey of As-Builts	Upon completion of Site restoration
Waste Material Manifests, Weight Tickets, and Disposal Receipts	Two days after material disposal
Backfill Material Weight Tickets	Upon delivery
Site Close-out Submittals	Upon completion of Site restoration and demobilization

Note:
The term 'day' shall be considered a weekday (Monday through Friday) excluding holidays recognized by the City of Tacoma.

20.0 REPORTING

The following reports will be prepared by the Engineer to document the work performed as part of the Aladdin Plating Site Remediation Project:

- **Remedial Action Construction Report (RACR)** – Upon completion of the Aladdin Plating Site Remediation Project, a RACR summarizing the remediation and results of performance monitoring will be prepared in accordance with WAC 173-340-400. Waste manifests, contaminated soil disposal receipts, and as-built drawings will be included in the RACR. A draft version of the RACR will be submitted to Ecology for review and comment prior to finalization.
- **Confirmational Groundwater Monitoring Report** – A report summarizing the results of confirmational groundwater monitoring will be prepared upon completion of groundwater monitoring activities.
- **Monthly Progress Report** – A monthly progress report will be made to Ecology.

Compliance monitoring data generated during the cleanup action will be provided to Ecology in the electronic format required by Ecology's Environmental Information Management Policy 840.

21.0 REFERENCES

GeoEngineers, Inc., 2014a. Cleanup Action Plan (CAP), Former Aladdin Plating Site, Tacoma, Washington. GEI File No 0504-095-00. December 10, 2014.

GeoEngineers, Inc. 2014b. Report of Findings – Soil Explorations and Groundwater Monitoring, Aladdin Plating Site, 1657 Center Street, Tacoma, Washington. June 16, 2014.

Landau Associates, 2005. Sampling and Analysis Plan, Groundwater Investigation, Former Aladdin Plating Facility, Tacoma, Washington. November 7, 2005.

Landau Associates, 2007a. Groundwater Monitoring Report, Fall 2006 through Spring 2007, Former Aladdin Plating Facility, Tacoma, Washington. July 31, 2007.

Landau Associates, 2007b. Cost Estimate for Additional Environmental Services, Completions of Remedial Investigation/Feasibility Study and Cleanup Action Plan, former Aladdin Plating Facility, Tacoma, Washington. April 18, 2007.

Walsh, T.J. (Walsh), 1987. Geologic map of the south half of the Tacoma quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 87-3, 1:100,000.

Washington State Department of Ecology (Ecology). 2007. Model Toxics Control Act Statute and Regulation, MTCA Cleanup Regulation, Chapter 173-340 WAC. Publication No. 94-06. Revised November 2007.

Washington State Department of Ecology (Ecology, 2005). Stormwater Management Manual for Western Washington.

22.0 LIMITATIONS

We have prepared this report for the exclusive use of the Washington State Department of Ecology and their authorized agents for the Aladdin Plating Site Remediation Project in Tacoma, Washington.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of environmental engineering in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

TABLES

Table 1

Soil Cleanup Levels[1]

Aladdin Plating Site Remediation Project

Tacoma, Washington

Chemicals of Concern[2]	**Site Cleanup Levels (mg/kg)**
Total Chromium	2,000
Chromium VI	18.4
Lead	250[3]
Nickel	417

Notes:

[1] Soil cleanup levels are taken from MTCA Method A Soil Cleanup Levels for unrestricted land use and MTCA Method B carcinogen and non-carcinogen values for human health protection and for protection of groundwater as drinking water, taken from Ecology's CLARC database. In general, the lowest of the regulatory criteria listed were identified as the proposed cleanup levels.

[2] Chemicals of concern for the Site were developed as part of the Cleanup Action Plan (GeoEngineers, 2014).

[3] A MTCA Method B cleanup level for lead has not been established. Therefore, the MTCA Method A cleanup level for unrestricted land use was used.

mg/kg = miligram per kilogram

Table 2

Groundwater Cleanup Levels[1]

Aladdin Plating Site Remediation Project

Tacoma, Washington

Chemicals of Concern[2]	Site-Specific Water Quality Standards[3] (µg/L)
Total Chromium	50
Chromium III	24,000
Chromium VI	48
Lead	15
Nickel	320

Notes:

[1] The Site cleanup levels for groundwater were developed as part of the Cleanup Action Plan (GeoEngineers, 2014) for protection of drinking water.

[2] Chemicals of concern for the Site were developed as part of the Cleanup Action Plan (GeoEngineers, 2014).

[3] Groundwater cleanup levels are taken from published values for the Safe Water Drinking Act and MTCA Method B carcinogen and non-carcinogen standard formula values for human health protection obtained from Ecology's CLARC database. In general, the lowest of the regulatory criteria listed were identified as the proposed cleanup levels.

µg/L = micrograms per liter

Table 3

Materials Type, Management and Disposal

Aladdin Plating Site Remediation Project

Tacoma, Washington

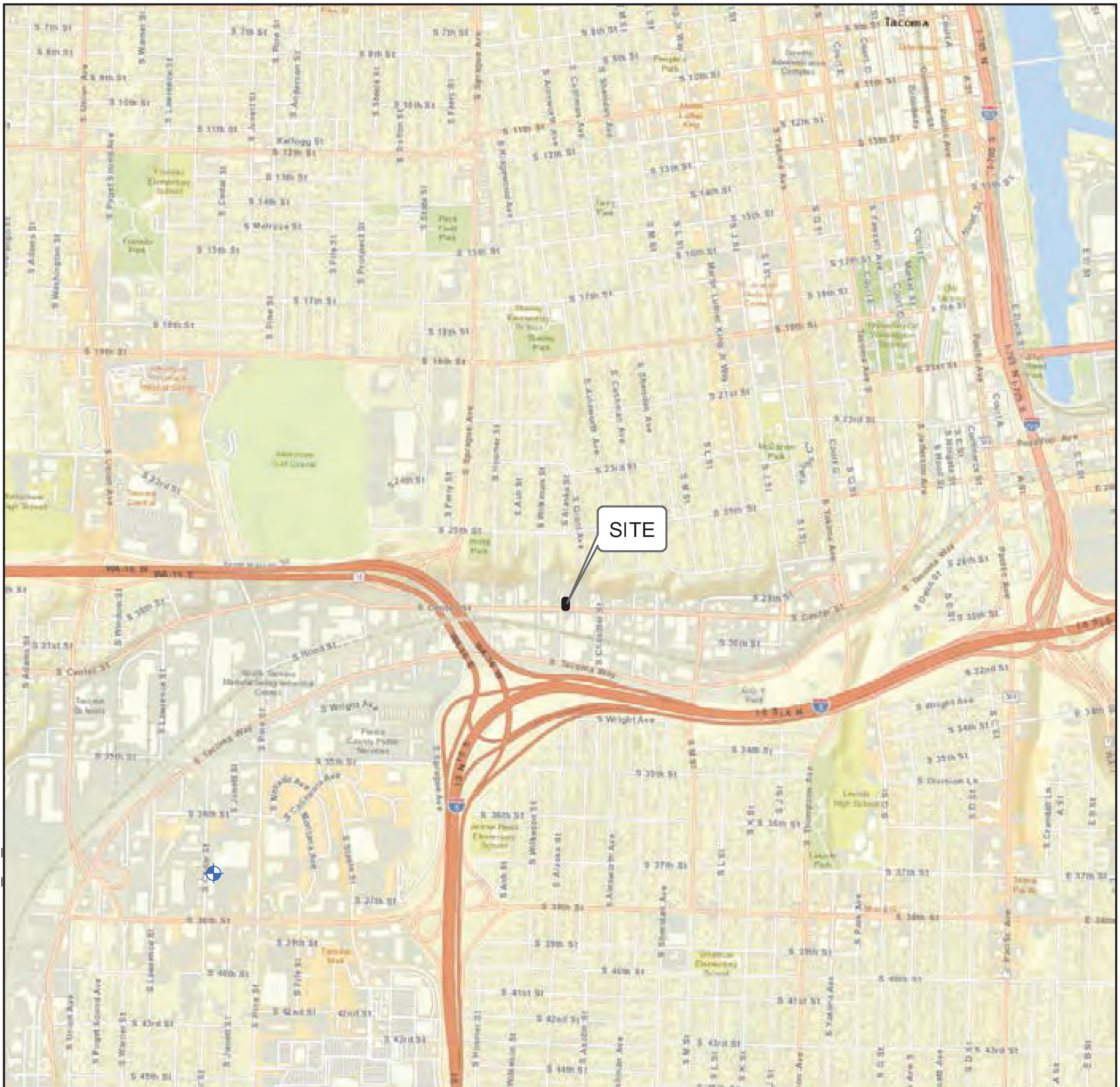
Material Type	Description of Material	Source of Material	Method of Material Management	Method of Disposal[1,2]
Vegetation	Above ground components of Site vegetation	Clearing and Grubbing	Minimize contact with Site soil and keep separate from other materials	Dispose of as landclearing debris
	Below ground components of Site Vegetation in contact with or containing Site soil	Clearing and Grubbing	Place in a stockpiled materials management area separate from other stockpiled materials	Disposal facility, Subtitle D or Subtitle C landfill, will be selected based on results of stockpile sampling and analysis
Trash	Paper, glass, wood, and other materials typical of municipal solid waste	Trash and Debris Collection and Management	Minimize contact with Site soil and keep separate from other materials	Dispose of at Subtitle D landfill
	Metal (excluding chainlink fencing to be removed, protected, and reinstalled during Site restoration)	Trash and Debris Collection and Management	Minimize contact with Site soil and keep separate from other materials	Recycle at recycling facility
		Removal of Existing Fencing		
Soil	Material excavated from Remedial Excavation Area (REA) 1	Remedial Excavation Area (REA) 1	Place in a stockpiled materials management area separate from other stockpiled materials	Disposal facility, Subtitle D or Subtitle C landfill, will be selected based on results of stockpile sampling and analysis

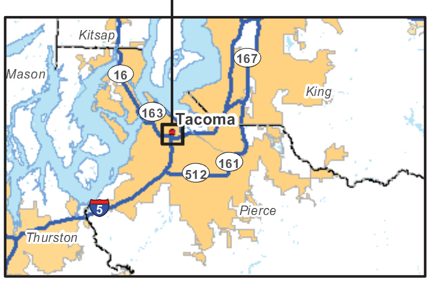
Notes:

[1] Disposal includes recycling where specified and appropriate.

[2] The method of disposal as well as the disposal facility and disposal location must be approved by the Engineer prior to disposal.

FIGURES





City of Tacoma production well

N
W
E
S

2,000 0 2,000

Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Data Sources: ESRI Data & Maps, Street Maps 2005
Base map from ESRI Data Online.
Transverse Mercator, Zone 10 N North, North American Datum 1983
North arrow oriented to grid north

Vicinity Map

Former Aladdin Plating Facility
Tacoma, Washington

GEOENGINEERS

Figure 1

Path: \\pdx\Projects\0\0504095_GIS\GIS\00\MXD\050409500_F1_VM.mxd

Office: PORT

Property Boundary

Parcel Boundary (Pierce County)

N
W E
S

100 0 100

Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Data Sources: Parcel Boundary and roads from Pierce County GIS.
Base map from ESRI Data Online.
Transverse Mercator, Zone 10 N North, North American Datum 1983
North arrow oriented to grid north

Site Map

Former Aladdin Plating Facility
Tacoma, Washington

GeoEngineers

Figure 2

Office: PORT Path: P:\0\0504095_GIS\GIS\00\MXD\050409500_F2_SM.mxd Map Revised: 08 January 2014 ccabrera

Map Revised: 24 July 2015 maugust

Path: \\pdx\projects\0\0504095_GIS\GIS\00\MXD\050409500_F3_OverviewofRemainingRemedial.mxd

Office: PORT

Data Source: Aerial base from ArcGIS Data Online.
Existing monitoring well locations from Landau Associates, Monitoring Well Locations and Groundwater Contours March 2007, Figure 4, 7/30/2007.

Projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Overview of Remaining Remedial Actions

Former Aladdin Plating Facility
Tacoma, Washington

GeoEngineers

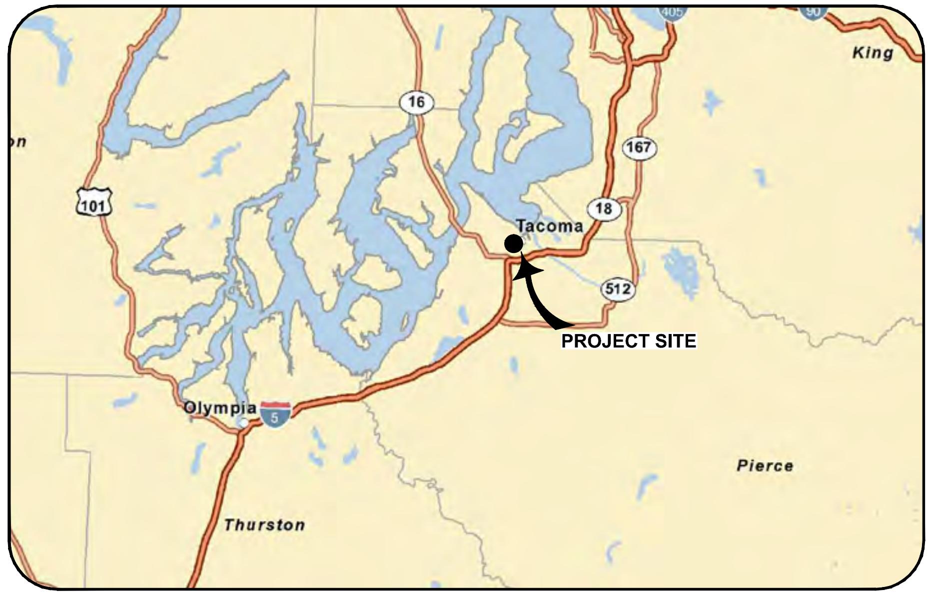
Figure 3

PROJECT
DRAWINGS

GeoEngineers

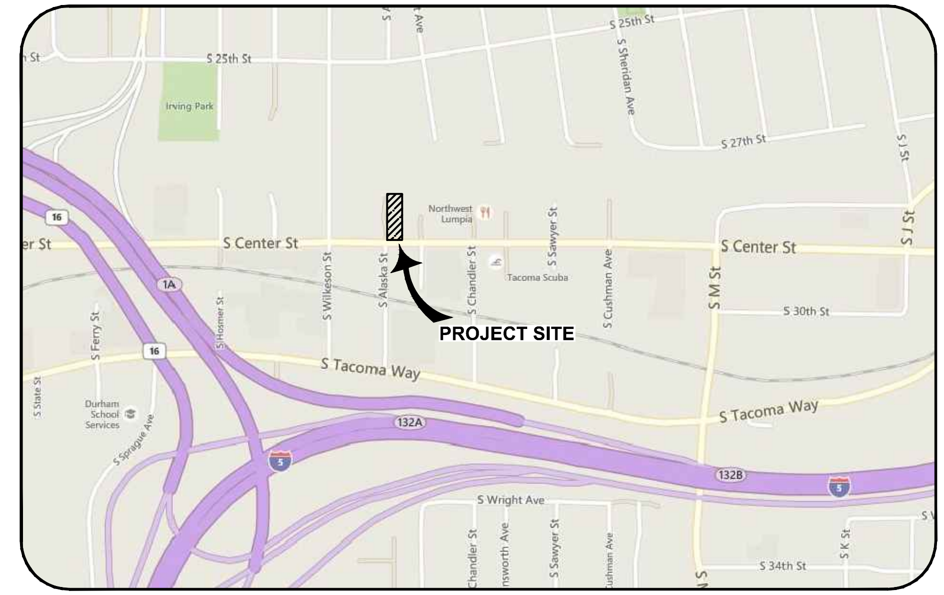
ALADDIN PLATING FACILITY - CLEANUP ACTION PLAN

VICINITY MAP



NTS N

LOCATION MAP



NTS N

ECOLOGY SITE MANAGER
MOHSEN KOUREHDAR
DEPARTMENT OF ECOLOGY
TOXICS CLEANUP PROGRAM
SOUTHWEST REGIONAL OFFICE
PO BOX 47775, OLYMPIA, WA
98504–7777
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SITE ADDRESS
ALADDIN PLATING
1657 CENTER ST
TACOMA, WA 98409

PARCEL NUMBER
2855000010

SHEET INDEX

Revision No:	Date:	Description:	Initials:	Designed: IY
				Drawn: CMV/SCY
				Checked: DAC
				Date: 07–30–2015
				Project No: 0504–095–01

ALADDIN PLATING FACILITY
1657 CENTER STREET
TACOMA, WASHINGTON

DEPARTMENT OF ECOLOGY
State of Washington

GEOENGINEERS
600 Stewart Street, Suite 1700
Seattle, Washington 98101

COVER SHEET
CLEANUP ACTION PLAN

Sheet
S-01

W:\Seattle\Projects\0\0504095\01\CAD\03_Sheet Files\050409501_S01-S02-S03.dwg TAB:S01 Date Exported: 07/30/15 - 15:16 by syi

GENERAL NOTES

1. LOCATIONS OF FEATURES ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY ALL FEATURES AND DIMENSIONS.
2. MOST CURRENT SPECIFICATIONS: ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH CITY OF TACOMA STANDARDS.
3. THE CONTRACTOR SHALL PROVIDE PHOTOGRAPHIC DOCUMENTATION OF PRE–CONSTRUCTION SITE CONDITIONS.
   - 3.1. PROVIDE PRIOR TO MOBILIZING TO THE SITE
   - 3.2. DOCUMENTATION INCLUDES WRITTEN SUMMARY OF OBSERVED DEFECTS AND DEFICIENCIES
   - 3.3. FORMAT: CD ROM
   - 3.4. DAMAGE OBSERVED WILL BE EVALUATED AGAINST THIS DOCUMENTATION
   - 3.5. DAMAGE TO ANY FEATURES THAT ARE DETERMINED BY THE ENGINEER TO HAVE BEEN INCURRED FOLLOWING THE PRE–CONSTRUCTION DOCUMENTATION EVENT SHALL BE REPAIRED TO THE PRE–CONSTRUCTION CONDITION OR BETTER BY THE CONTRACTOR AT NO COST TO THE PROJECT.
4. UTILITY LOCATES
   - 4.1. COMPLY WITH WASHINGTON'S "CALL BEFORE YOU DIG LAW" RCW 19.122.
   - 4.2. NOTIFY METRO PARKS TACOMA 1–WEEK IN ADVANCE OF UTILITY LOCATES.
   - 4.3. MARK THE EXCAVATION AREA, AND LOCATE PRIVATE AND PUBLIC UTILITIES, INCLUDING IRRIGATION, AT LEAST 7 DAYS PRIOR TO CONSTRUCTION ACTIVITIES.
   - 4.4. VERIFY ALL PUBLIC UTILITIES BY CALLING 1–800–424–5555 AT LEAST 7 WORKING DAYS PRIOR TO CONSTRUCTION
   - 4.5. VERIFY PRIVATE UTILITIES USING A PRIVATE UTILITY LOCATOR AT LEAST 7 WORKING DAYS PRIOR TO CONSTRUCTION FOR PRIVATE UTILITIES.
   - 4.6. NO EXCAVATION SHALL BE PERFORMED UNTIL THE SITE UTILITIES HAVE BEEN FIELD LOCATED.
   - 4.7. RESTORE AND REPAIR UTILITIES DAMAGED AS A RESULT OF CONTRACTOR'S OPERATIONS IMMEDIATELY AT THE CONTRACTOR'S EXPENSE.
5. WORK LIMITS
   - 5.1. NO WORK SHALL OCCUR OUTSIDE OF THE DESIGNATED WORK LIMITS.
   - 5.2. RESTORE DAMAGED UTILITIES WITHIN 24–HOURS OF THE DAMAGE OCCURRING
   - 5.3. REPORT DAMAGED UTILITIES TO THE ENGINEER WITHIN 24–HOURS OF THE INCIDENT
   - 5.4. MEET EXISTING CODES AND LOCAL JURISDICTION STANDARDS
   - 5.5. DO NOT BACKFILL UNTIL REPAIR IS APPROVED BY THE ENGINEER.
6. FIRE ACCESS

   THE CONTRACTOR SHALL ENSURE COMPLIANCE WITH CHAPTER 33 OF THE 2012 IFC FOR ALL CONSTRUCTION ACTIVITIES. ADEQUATE FIRE APPARATUS ACCESS SHALL BE PROVIDED TO THE SITE AT ALL TIMES DURING CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE TO ENSURE THE ACCESS IS KEPT CLEAR AT ALL TIMES.

WORK AREA ACCESS NOTES

1. AREAS: DELINEATE REMEDIATION AREA LIMITS FOR ENGINEER APPROVAL. ADJUST LIMITS AS DIRECTED BY ENGINEER. DO NOT PAINT PERMANENT FEATURES.
2. WORK LIMITS: THE CONTRACTOR SHALL LIMIT ALL ACTIVITIES TO WITHIN THE PROJECT WORK LIMITS AND TO AREAS SPECIFICALLY DESIGNATED FOR CONSTRUCTION ACCESS AND STAGING.
3. ACCESS CONTROL: CONTRACTOR SHALL MAINTAIN FENCING FOR ACCESS CONTROL AROUND THE ENTIRE PERIMETER OF THE WORK LIMITS INCLUDING ACCESS AND STAGING AREAS THROUGHOUT THE ENTIRE DURATION OF CONSTRUCTION.
4. ACCESS: CONTRACTOR SHALL USE ONLY THE DESIGNATED ACCESS LOCATIONS INDICATED ON THE PLANS OR ALTERNATE LOCATIONS APPROVED BY THE ENGINEER. CONTRACTOR SHALL REMOVE, STORE, AND RE–INSTALL, AS REQUIRED, ANY OBSTRUCTIONS SUCH AS ROCKS, SHRUBS, FENCES, GATES, BOLLARDS, AND OTHER ITEMS NEEDED FOR ACCESS AND REMEDIATION. PROTECT AND WORK AROUND ITEMS THAT CANNOT BE TEMPORARILY REMOVED.
5. PROTECT EXISTING FEATURES: PROTECT ALL EXISTING FEATURES INCLUDING SIDEWALKS, PATHS, PAVEMENT, VALVE BOXES, STORMWATER DRAINAGE PIPES, UTILITIES, AND OTHER FEATURES. PROVIDE PROTECTIVE MEASURES TO PREVENT DAMAGE TO FEATURES AS REQUIRED. ANY DAMAGE TO GROUNDS AND FEATURES SHALL BE REPAIRED BY THE CONTRACTOR TO EXISTING CONDITIONS OR BETTER. CONTRACTOR SHALL REPAIR DAMAGE TO ACCESS ROUTES AND STAGING AREAS.
6. TRAFFIC CONTROL: PROVIDE TRAFFIC CONTROL PER CITY OF TACOMA AND WSDOT STANDARDS, INCLUDING THE MANUAL OF UNIFORM TRAFFIC CONTROL (LATEST EDITION) FOR TRUCK TRAFFIC. CONTRACTOR TO OBTAIN ACCESS AGREEMENT/APPROVALS FROM CITY OF TACOMA FOR WORK WITHIN THE STREET RIGHT OF WAY AND SIDEWALK.
7. LAY OUT: CONTRACTOR TO LAY OUT THE WORK BASED ON SITE PHYSICAL FEATURES AS INDICATED ON THE DRAWINGS, AND SUPPLEMENTED BY DIMENSIONS AND/OR COORDINATES INDICATED. WHERE THE REMEDIATION ABUTS A PHYSICAL FEATURE TO REMAIN (E.G., SIDEWALK OR CURB), REMEDIATION SHALL OCCUR UP TO THAT FEATURE, BUT SHALL NOT UNDERMINE OR DAMAGE THE FEATURE.
8. LOADING: LONG–HAUL TRUCKS SHALL BE LOADED WITHIN THE ON–SITE ACCESS AREAS, NOT IN PUBLIC STREETS OR ALLEYS. LONG–HAUL TRUCKS SHALL ENTER SITE ONLY TO THE EXTENT NECESSARY FOR LOADING. PROVIDE AND MAINTAIN CONTRACTOR DESIGNED "CLEAN" TRUCK LOADING PADS CONSISTING OF PLYWOOD, STEEL PLATES, OR TRUCK PLATES, AND 10–MIL PLASTIC SHEETING. CLEAN PAD AFTER EACH TRUCK LOADING EVENT, AND REPLACE DISPOSABLE ELEMENTS DAILY OR MORE FREQUENTLY IF NECESSARY. TRACKING OR RELEASE OF CONTAMINATED SOILS BEYOND WORK LIMITS IS STRICTLY PROHIBITED. AFTER LOADING AND PRIOR TO LEAVING THE SITE, INSPECT ALL TRUCKS AND REMOVE ANY SPILLED SOIL ON TRUCK OR GROUND. PREVENT GENERATION OF DUST AND TURBID WATER WHEN CLEANING TRUCKS. ALL TRUCK LOADS SHALL BE COVERED WITH A HEAVY DUTY TARP THAT SEALS AROUND THE TRUCK BED TO PREVENT DUST RELEASE DURING HAUL.
9. MATERIAL DELIVERY: PREVENT SPREAD OF CONTAMINATED SOILS TO CLEAN AREAS. LONG–HAUL TRUCKS AND MATERIAL SUPPLY TRUCKS SHALL NOT DRIVE ON CONTAMINATED SOILS. VEHICLES AND EQUIPMENT USED TO SPREAD MATERIAL SHALL NOT CROSS BACK AND FORTH BETWEEN CONTAMINATED SOIL AREAS AND CLEAN BACKFILL AREAS. PROVIDE AND REMOVE CLEAN TEMPORARY HAUL ROADS AS REQUIRED.

LEGEND

	EXISTING	NEW
ROAD CENTERLINE		
POWER POLE		
CATCH BASIN		
MANHOLE	MH	
PROPERTY LINE		
SANITARY SEWER	SS	
STORM DRAIN	D D	
MAJOR CONTOUR	325	
MINOR CONTOUR		
CHAINLINK FENCE	X X	
SILT FENCE		X X
BERM		
TEMPORARY CHAIN LINK FENCE		
WORK LIMITS		
2.5–FOOT EXCAVATION		
5.0–FOOT EXCAVATION		
9.0–FOOT EXCAVATION		
11.0–FOOT EXCAVATION		
16.0–FOOT EXCAVATION		
EXISTING MONITORING WELL TO BE DECOMMISSIONED	MW-1s	

Revision No:	Date:	Description:	Initials:	
				Designed: IY
				Drawn: CMV/SCY
				Checked: DAC
				Date: 07–30–2015
				Project No: 0504–095–01

ALADDIN PLATING FACILITY
1657 CENTER STREET
TACOMA, WASHINGTON

DEPARTMENT OF ECOLOGY
State of Washington

GEOENGINEERS
600 Stewart Street, Suite 1700
Seattle, Washington 98101

GENERAL NOTES AND LEGEND

CLEANUP ACTION PLAN

Sheet S-02

EDR NOTES

The Contractor shall manage all water generated during the work performed at the Site. Water requiring management by the Contractor will include, but is not limited to, the following:

- Stormwater runoff collected at the Site;
- Water resulting from runoff of dust control water; and
- Water generated as part of decontamination.

All water generated during Project work shall be collected treated of necessary and discharged to the completed remedial excavation for infiltration in accordance with the requirements of this EDR Section 10.3.

The Contractor shall perform the following as well as other work, as necessary, as part of water management and disposal:

- Provide a Water Management Plan for water collection, treatment, and discharge that identifies the equipment and procedures to be used to control, collect, and transfer all water generated during the work to meet or exceed the requirements of the contract. This plan shall be submitted to the Engineer for review prior to initiation of the work.
- Provide a suitable water storage system to manage all of the water generated during the work.
- Provide suitable water collection, transfer, and transport equipment so that all of the water generated during the work can be transferred from points of generation within the Site to the water storage system components and to the completed remedial excavation for discharge and infiltration.
- Provide, install and remove dewatering equipment, as necessary, to complete all work. The Contractor shall provide well points, pumps, and other equipment and materials, as necessary, to dewater excavation areas including, but not limited to, remedial excavation areas, and site grading and capping areas.
- Collect and treat all water from within the Site boundaries during all work and discharge water to the completed remedial excavation for infiltration.

The Contractor shall employ Best Management Practices (BMPs) to control erosion during all work including, but not limited to, Site preparation, demolition, excavation, backfilling, grading, capping, and restoration activities. The Contractor shall implement erosion control and stormwater pollution prevention BMPs consistent with the following:

- Washington State Department of Ecology Stormwater Management Manual for Western Washington (Ecology, 2005); and
- Project Stormwater Pollution Prevention Plan (SWPPP) (Attachment 5).

The Contractor shall also implement erosion control and stormwater pollution prevention procedures in accordance with requirements of this section. Erosion control and stormwater pollution prevention procedures shall include the following:

- Installation and maintenance of temporary erosion and sediment control (TESC) measures as identified on Sheet S-04.
- Install stormwater inlet protection in catch basins potentially subject to Site runoff.
- Install stormwater controls such as silt fencing, protection barriers, and sediment traps, as needed, within the limits of work area to collect all stormwater runoff and to avoid any stormwater run-on into the work area. Stormwater controls shall be approved by the Engineer prior to placement. Upon completion of construction backfill and compaction, the Contractor will remove stormwater controls and protection barriers including berming to allow stormwater flow patterns to return to previous flow.
- Remove sediment deposits when the deposits reach 6 inches above the pre-existing ground surface on the upgradient side of the TESC measures.
- Transfer or pump all water including stormwater runoff resulting from erosion and sediment control and stormwater pollution prevention activities into the water collection system. All water including stormwater runoff will be captured prior to leaving the Site. The requirements for the water management and disposal and the water treatment system are described in Section 10.3.
- Clear only those areas where immediate activity will take place and maintain original ground cover as long as practicable.
- Implement dust control techniques, as necessary, for construction activities that could generate dust. Dust control techniques must be approved by the Engineer prior to application. Routine maintenance of the chosen dust control technique(s) is necessary to keep dust to a minimum and to meet Northwest Clean Air Agency restrictions of airborne particulates. The Contractor shall coordinate use of water sources from public or private sources, as necessary, to provide dust control. The Contractor is responsible for acquiring a water use permit, acquiring, installing, and maintaining any equipment necessary for use of permitted water sources, and any associated expenses, as required. Water applied as dust control shall not leave the Site as surface water runoff and will be collected and pumped into the water treatment system.
- Keep streets clean of construction debris, soil, fill material, and/or mud (i.e., sediment resulting from project work) associated with construction vehicles and equipment or any other construction activity. Any sediment resulting from the work that is tracked onto pavement shall be removed by shoveling or street sweeping. The sediment resulting from the work removed by sweeping shall be combined with soil transported off site for disposal The pavement shall not be cleaned by washing down the street, except when sweeping is ineffective. Runoff from street washing must be collected and pumped into the water treatment system. If sediment resulting from the work is tracked onto off-site pavement areas, alternative measures to keep the streets free of sediment must be implemented.
- The Contractor shall locate all utilities present in the vicinity of the remedial excavation areas prior to any work that could damage existing Site utilities. The Contractor is responsible for field-locating all existing utilities and shall use all appropriate methods to locate utilities present at the remedial excavation areas. Such methods may include, but are not limited to, subcontracting for utility locating services and potholing using safe-dig techniques (i.e., use of an air knife) prior to beginning work.
- The Contractor shall complete clearing and grubbing in the remedial excavation areas, including, but not limited to, demolition of the asphalt pavement access road and removal of the gravel base course prior to initiation of remedial excavation activities.
- The Contractor shall stake the remedial excavation boundaries shown on Sheet S-04 and S-05 prior to excavation activities and protect and preserve the survey stakes during the work.
- The Contractor shall decommission monitoring wells MW-1s, MW-2s, MW-3s, and MW-4s/4d that are present at the Site as shown on Sheets S-04 and S-05. The monitoring wells will be decommissioned by a driller licensed in the State of Washington in accordance with the Regulation and Licensing of Well Contractors and Operators (Chapter 173-162 WAC). The monitoring wells will be protected from damage prior to decommissioning.
- The Contractor shall initially excavate materials to the horizontal and vertical limits shown and stockpile the materials from each area separately in stockpiled materials management areas. The excavation sidewalls shall not initially be sloped unless required to meet WISHA or OSHA requirements. The Engineer will observe excavation activities and provide guidance on excavated material segregation within the stockpiled materials management areas.
- The Contractor shall be solely responsible for excavation slope stability. Excavation work shall be performed in compliance with applicable regulations and in accordance with the Contractor's HASP.
- If necessary, the Contractor shall provide all materials, labor and equipment necessary to shore remedial excavations to protect the work, existing property, utilities, pavement, and any other structures and to provide safe working conditions in the excavation as per WSDOT Standard Specification 7-08.3(1)B and in compliance with applicable local, state or federal safety codes. Shoring plans will be submitted to the Engineer for review before any shoring is installed. Damage resulting from improper shoring or failure to shore shall be the sole responsibility of the Contractor.
- The Contractor shall be aware that the surface and subsurface at the Site consists of fill materials including, but not limited to, soil and gravel If changed conditions.
- Prevent odors and generation of dust or loss of materials during remedial excavation in accordance with the City's ordinance(s) or as directed by the Engineer.
- Prevent cross-contamination and re-contamination of remediated areas and any portion of the Site outside the remedial excavation areas. At the determination of the Engineer, the Contractor shall excavate any cross-contaminated and/or re-contaminated material at the Contractor's expense.
- Support any structures or active utilities adjacent to remedial excavation areas, as necessary, during excavation activities to prevent damage to any structure or utility, or unsafe working conditions. Damaged structures, utilities, or other facilities shall be repaired or replaced at the Contractor's expense as determined by the Engineer.
- Where excavation of materials in the vicinity of any existing active utilities proves to be exceedingly hazardous, utilize safe dig technologies (air knife, vacuum truck potholing, etc.) to the extent practicable.
- Allow and provide safe access to the Engineer for observation during remedial excavation work. Excavate additional materials beyond the horizontal and/or vertical limits shown, if there are visual observations indicating that soil at the limits of the remedial excavations is contaminated and stockpile with previously excavated and stockpiled material from the same location. The Contractor shall perform this additional excavation only as directed by the Engineer.
- Allow and provide safe access to the Engineer for collection of samples during remedial excavation work. Assist the Engineer in obtaining samples from the sidewalls and base of remedial excavation areas during the excavation whenever exposed areas of the excavation are not readily accessible for such sampling activities. Excavate additional materials beyond the horizontal and/or vertical limits shown, if the verification sample analysis results indicate that soil at the limits of the remedial excavation(s) exceed the cleanup levels and stockpile with previously excavated and stockpiled material from the same location. The Contractor shall perform this additional excavation only as directed by the Engineer.
- If water is encountered in a remedial excavation, the contractor shall remove, control, and store the water prior to discharge for infiltration according to the requirements in EDR Section 10.3.
- The Contractor shall not backfill the remedial excavation areas until the areas have been approved by the Engineer for backfill. Conditions to be achieved for backfill approval include, but are not limited to, achieving the total depth and horizontal extent of contaminated material removal based on visual observation and completion of verification sampling and analysis, and receipt of analytical results indicating that the material in the excavation sidewalls and bottom meet the cleanup levels.
- Material that is removed from each remedial excavation area shall be temporarily stockpiled on site for disposal characterization and shall be contained in separate, stockpiled materials management areas in accordance with the specification in EDR Section 10.2.
- The Contractor shall perform Site restoration work following the completion of backfill and compaction of the remedial excavation area to proposed contours shown on Sheet S-05. Finished surface shall conform within ±2 inches of proposed contours.

Revision No:	Date:	Description:	Initials:	
				Designed: IY
				Drawn: CMV/SCY
				Checked: DAC
				Date: 07-30-2015
				Project No: 0504-095-01

ALADDIN PLATING FACILITY
1657 CENTER STREET
TACOMA, WASHINGTON

DEPARTMENT OF ECOLOGY
State of Washington

GEOENGINEERS
600 Stewart Street, Suite 1700
Seattle, Washington 98101

EDR NOTES

CLEANUP ACTION PLAN

Sheet
S-03

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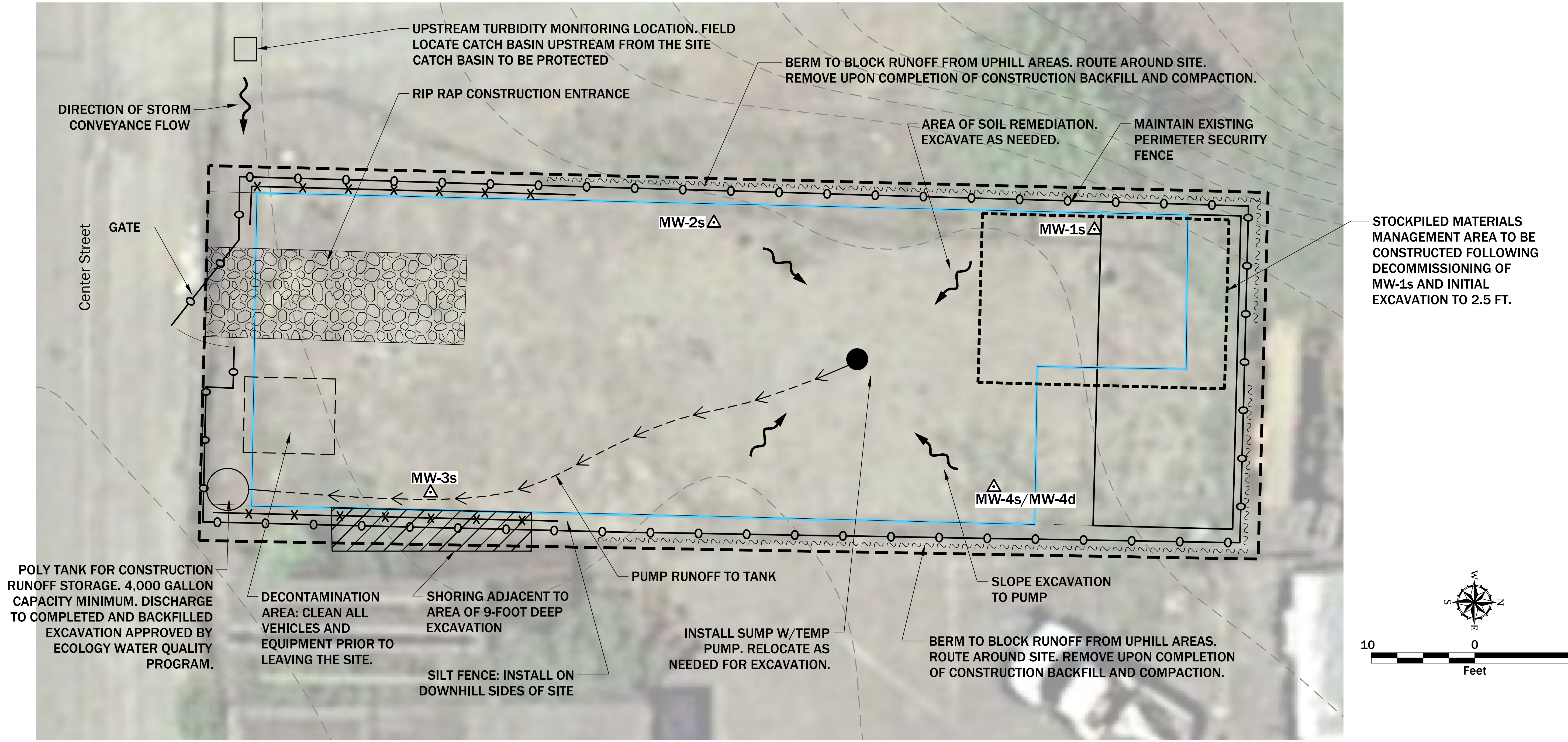

NOTES:

1. SITE CONTAINS CONTAMINATED SOIL. IF SOIL IS TRACKED INTO THE RIGHT-OF-WAY IMMEDIATELY CLEAN IT.

Revision No:	Date:	Description:	Initials:	Designed: IY
				Drawn: CMV/SCY
				Checked: DAC
				Date: 07-30-2015
				Project No: 0504-095-01

ALADDIN PLATING FACILITY
1657 CENTER STREET
TACOMA, WASHINGTON

DEPARTMENT OF ECOLOGY
State of Washington

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600 Stewart Street, Suite 1700
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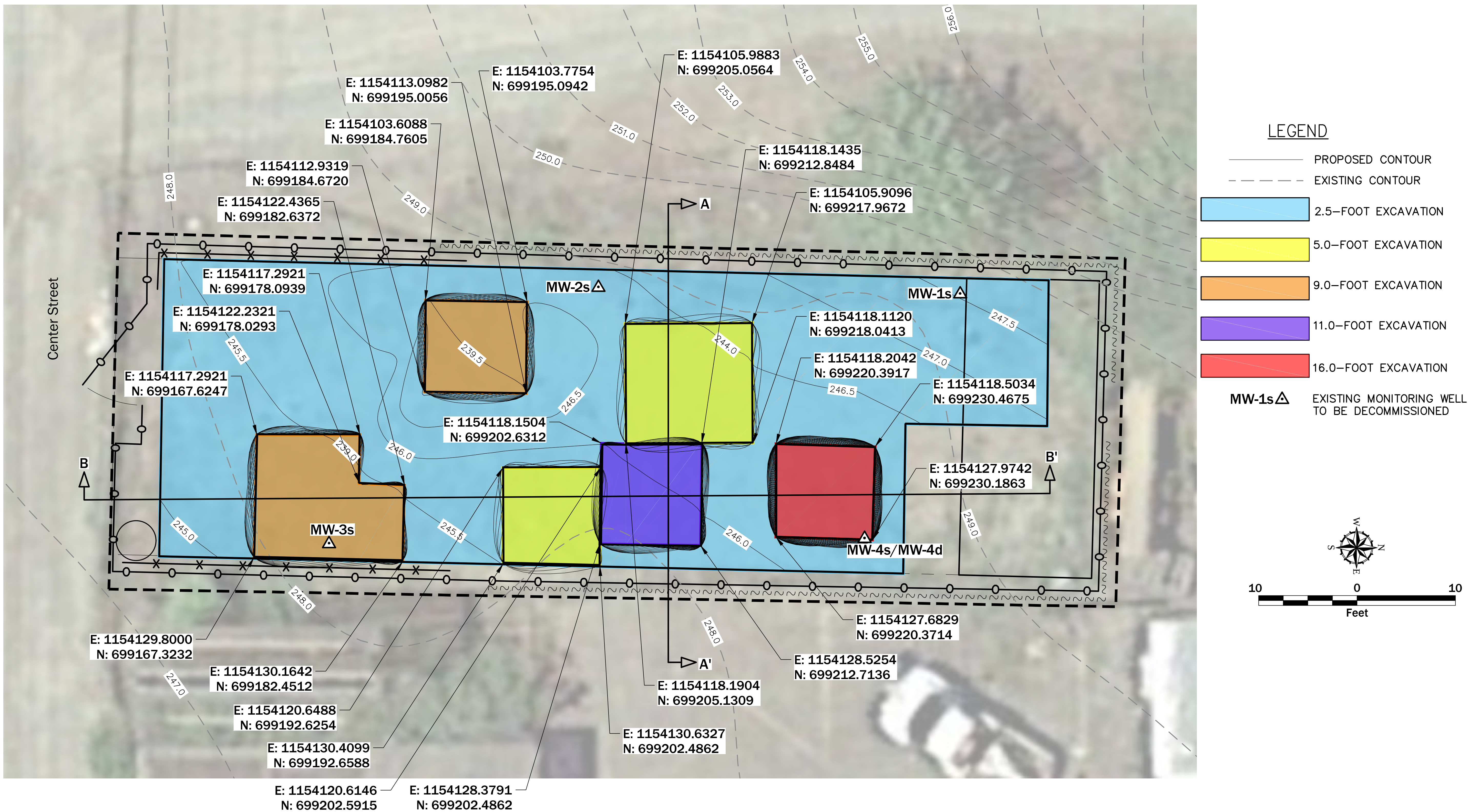
EXCAVATION AND TESC PLAN

CLEANUP ACTION PLAN

Sheet
S-04



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Revision No:	Date:	Description:	Initials:	
				Designed: IY
				Drawn: CMV/SCY
				Checked: DAC
				Date: 07-30-2015
				Project No: 0504-095-01

ALADDIN PLATING FACILITY
1657 CENTER STREET
TACOMA, WASHINGTON

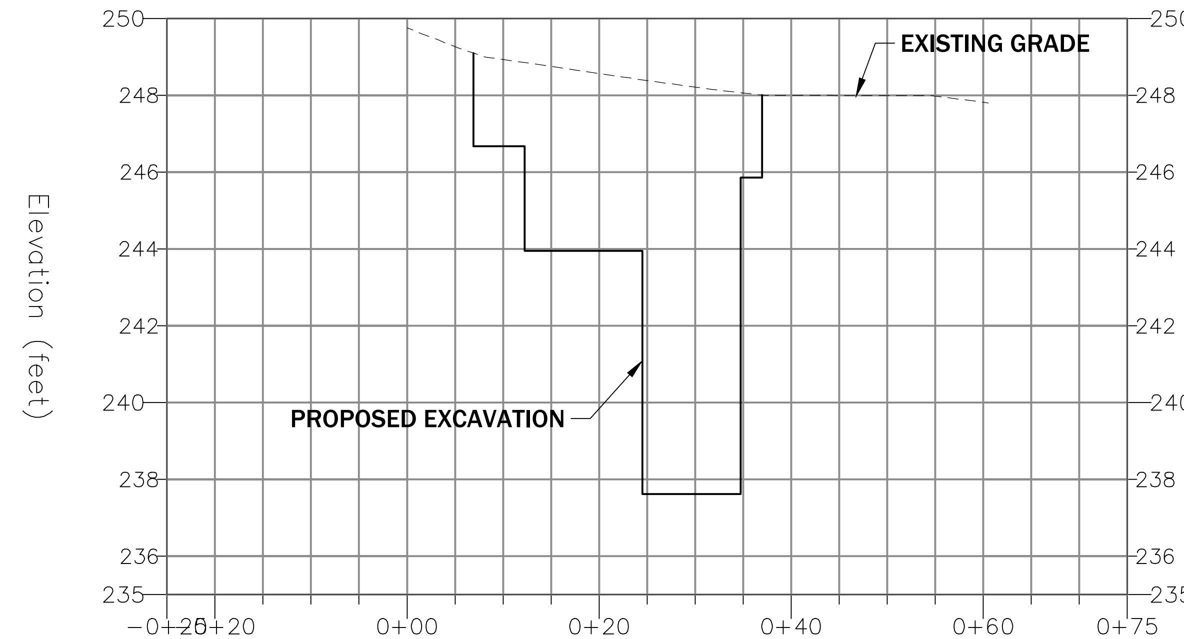
DEPARTMENT OF ECOLOGY
State of Washington

GEOENGINEERS
600 Stewart Street, Suite 1700
Seattle, Washington 98101

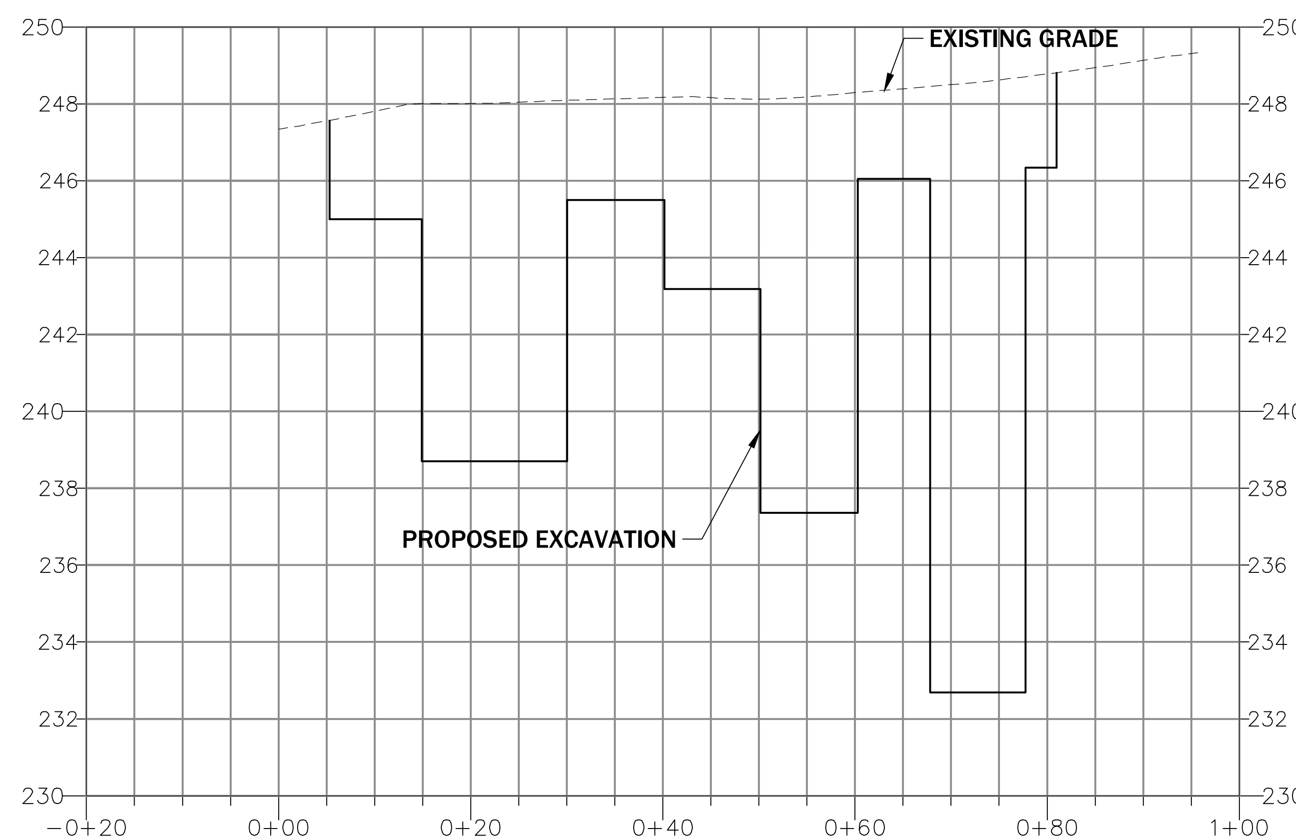
SITE PLAN

CLEANUP ACTION PLAN

Sheet
S-05



SECTION A-A' A 4



SECTION B-B' B 4

HORIZONTAL SCALE: 1"= 20'
VERTICAL SCALE: 1"= 5'
VERTICAL EXAGGERATION: 4X

20 0 20
Feet

Revision No:	Date:	Description:	Initials:	
				Designed: IY
				Drawn: CMV/SCY
				Checked: DAC
				Date: 07–30–2015
				Project No: 0504–095–01

ALADDIN PLATING FACILITY
1657 CENTER STREET
TACOMA, WASHINGTON

DEPARTMENT OF ECOLOGY
State of Washington

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SITE SECTIONS

CLEANUP ACTION PLAN

Sheet
S-06

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ATTACHMENTS

ATTACHMENT 1
Compliance Monitoring Plan (CMP)

Compliance Monitoring Plan

Aladdin Plating Site Remediation Project
1657 Center Street
Tacoma, Washington

for
Washington State Department of Ecology

August 26, 2015

GeoEngineers
Earth Science + Technology

Compliance Monitoring Plan

Aladdin Plating Site Remediation Project
1657 Center Street
Tacoma, Washington

for
Washington State Department of Ecology

August 26, 2015

GeoEngineers

Plaza 600 Building
600 Stewart Street, Suite 1700
Seattle, Washington 98101
206.728.2674

Compliance Monitoring Plan

Aladdin Plating Site Remediation Project
Tacoma, Washington

File No. 0504-095-01

August 26, 2015

Prepared for:

Washington State Department of Ecology
Toxics Cleanup Program
300 Desmond Drive
Lacey, Washington 98504

Attention: Mohsen Kourehdar

Prepared by:

GeoEngineers, Inc.
Plaza 600 Building
600 Stewart Street, Suite 1700
Seattle, Washington 98101
206.728.2674

Ian Young, LG
Project Manager

Dave A. Cook, LG, CPG
Principal

IDY:DAC:leh

GeoEngineers

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LIST OF FIGURES

APPENDICES

1.0 INTRODUCTION

This document presents the Compliance Monitoring Plan (CMP) for the remedial action to be performed at the Aladdin Plating Site (Site) located at 1657 Center Street, in Tacoma, Washington (Figure 1). The remedial action is being conducted by the Washington State Department of Ecology (Ecology) to address contamination resulting from releases from past metal plating operations at the Site. The Aladdin Plating Facility/Site Identification Number (ID) is 1277 and Cleanup Site ID is 3257.

Remediation activities are being completed in accordance with the Cleanup Action Plan (CAP) (GeoEngineers, 2014) prepared for the Site to address contamination resulting from releases of metals from past metal plating operations at the Site. This CMP has been prepared in accordance with Washington Administrative Code (WAC) 173-340-410 to describe the protection, performance, and confirmation monitoring to be performed to protect human health and the environment and verify the effectiveness of the remedial action. The CMP was developed and is intended to be used in conjunction with the Engineering Design Report (EDR) (GeoEngineers, 2015a) prepared for the Aladdin Plating Site.

2.0 BACKGROUND

2.1. Previous Site Investigations

Three investigations were conducted at the Site from 2005 to 2007 by Ecology and Landau Associates to characterize Site soil and groundwater. Groundwater monitoring wells have been installed both on-property and off-property, including wells screened in the shallow aquifer from approximately 30 to 55 feet below ground surface (bgs) to assess impacts to the local shallow aquifer, and one well to a depth of approximately 80 feet bgs to characterize deeper groundwater conditions. Site contaminants of concern have been identified by Ecology as total chromium, hexavalent chromium, lead, and nickel in on-property soil, and total chromium, hexavalent chromium, and nickel in the shallow groundwater aquifer. Four rounds of groundwater monitoring with chemical analysis and groundwater level measurements, and an additional nine rounds of groundwater level measurements, were conducted at the Site from 2005 to 2007 from both on-property and off-property wells. The extent of Site contaminants was not defined within the context of those investigations and monitoring events.

In April 2007, Landau Associates proposed additional remedial investigation services to define the extent of on-property and off-property impacts at the Site to assess and select effective remediation strategies to achieve Site cleanup (Landau Associates, 2007). Landau Associates' proposed remedial investigation and feasibility study (RI/FS) would support a Cleanup Action Plan (CAP) addressing Site soil and groundwater contamination. Landau Associates' proposal was not implemented. No further investigations or cleanup actions occurred at the Site between 2007 and this RI. Additional Information concerning Site soil and groundwater investigations are presented in the CAP (GeoEngineers, 2014).

2.2. Nature and Extent of Contamination

2.2.1. Soil

Soil present at the Site contains metals including hexavalent chromium, lead, and nickel at concentrations above respective Model Toxics Control Act (MTCA) cleanup levels generally in shallow soil (0.5 to 3.5 feet bgs) and one deeper sample (7.0-7.5 feet bgs) in the central portion of the Site property, where historical chrome and nickel plating operations occurred. Total chromium was detected in all soil borings, but did not exceed the MTCA cleanup level. Exceedances of the MTCA Method B cleanup level for direct contact for nickel were detected in deeper soil.

Contaminant source concentrations in soil of chromium, lead, and nickel are generally limited at the Site property to shallow depths, with exceptions at limited locations where nickel contamination was identified at greater depths, and where hexavalent chromium exceedance was identified at 7.0 to 7.5 feet bgs.

2.2.2. Groundwater

One recent round of groundwater monitoring has been performed at the Site in monitoring wells MW-1, through MW-7 in 2014. Contaminants of concern were detected above MTCA cleanup levels in groundwater in on-property monitoring well MW-4s (total chromium, total nickel, and dissolved nickel). These same contaminants of concern exceeded cleanup levels in groundwater in limited soil borings immediately downgradient of well MW-4s.

At groundwater sample locations where total chromium exceeded the MTCA Method A cleanup level of 50 micrograms per liter (µg/L), results of speciated analysis for hexavalent chromium were either below the MTCA Method B cleanup level of 48 µg/L or below laboratory detection. The data indicate that impacts to the shallow groundwater aquifer exceeding cleanup levels are limited to a contaminant source near MW-4s and downgradient locations within 200 feet of the property for total chromium and nickel. The absence of detectable concentrations of hexavalent chromium in groundwater from downgradient borings indicate that total chromium detected in groundwater at these locations represents trivalent chromium, which limits the extent of exceedances of chromium in Site groundwater to the source property with no off-property impacts).

3.0 COMPLIANCE MONITORING

Compliance monitoring will be implemented during the Site remedial action in accordance with the CAP (GeoEngineers, 2014) and WAC 173-340-410. The three types of compliance monitoring to be conducted include protection monitoring, performance monitoring, and confirmational monitoring. The objectives of compliance monitoring are to protect human health and the environment during the remedial action (protection monitoring), verify that cleanup standards have been achieved and, if appropriate, that other performance standards have been achieved such as monitoring necessary to demonstrate compliance with a permit or substantive requirements of other programs (performance monitoring), and confirm the long-term effectiveness of the remedial action (confirmational monitoring). Compliance monitoring activities are described in the following sections.

3.1. Protection Monitoring

Protection monitoring will include monitoring of worker health and safety and environmental protection practices such as stormwater, erosion, and sediment controls. The purpose of protection monitoring is to confirm that human health and the environment are adequately protected during the remedial action.

3.1.1. Worker Health and Safety

Remediation-related construction activities will be performed in accordance with the requirements of the Washington Industrial Safety and Health Act (WISHA) (RCW 49.17) and the Federal Occupational Safety and Health Act (OSHA) (29 CFR 1910, 1926). These regulations include requirements that workers are to be protected from exposure to contaminants. A site-specific Health and Safety Plan (HASP) applicable to GeoEngineers' work is included as Appendix A. The selected construction contractor will be required to prepare and submit a separate HASP for use by the contractor's personnel. Personnel engaged in work that involves hazardous material excavation and handling shall comply with the provisions of WAC 173-340-810 (MTCA Cleanup Regulation, Worker Safety and Health) and be Hazardous Waste Operations and Emergency Response (HAZWOPER), Federal Occupational Safety and Health Act (OSHA) and/or WISHA certified.

3.1.2. Environmental Protection

Environmental protection measures consisting of best management practices (BMPs) for stormwater, sediment, drainage, and erosion control; spill prevention and pollution control; and all other controls needed to protect environmental quality during remedial actions will be implemented. Environmental protection measures including a Spill Prevention, Control and Countermeasure (SPCC) Plan will be prepared and provided by the selected contractor in the contractor's submittal package. The Contractor will be required to conform with all permits for the project and implement the project-specific Stormwater Pollution Prevention Plan (SWPPP) including the installation, inspection and maintenance necessary for stormwater management, temporary erosion and sediment control measures, and SPCC measures, as necessary, for the duration of the project. The minimum standards for environmental protection measures that will be implemented are described in the EDR (GeoEngineers, 2015a) and the project-specific SWPPP. If any governmental agency determines that the contractor's environmental protection measures are inadequate to meet the intent of applicable regulations, the contractor will be required to implement additional stormwater runoff, erosion control, and/or SPCC measures to address the deficiencies.

3.2. Performance Monitoring

Performance monitoring will be conducted to verify that the remedial action attains the cleanup levels established for the Site as well as other performance standards including characterization and monitoring necessary to demonstrate compliance with permit, disposal, and discharge requirements. Performance monitoring to be performed as part of the remedial action includes the following:

- Backfill and capping material characterization;
- Limits of soil excavation verification;
- Soil stockpile characterization for disposal; and
- Water characterization prior to discharge.

The following sections further describe performance monitoring to be performed at the Site as part of the remedial action.

3.2.1. Backfill Material Characterization

The contractor selected to perform remedial activities will identify the source or sources (i.e., borrow pits, supplier facilities, etc.) that are proposed to provide backfill and capping materials and shall also provide the results of grain-size distribution (ASTM International [ASTM] D 422) and modified Proctor (ASTM D 1557) tests performed on all proposed types of backfill and capping material from the identified sources. GeoEngineers personnel shall perform an inspection of the proposed backfill and capping material sources and collect samples to chemically characterize the backfill and capping material. Chemical analyses will be performed on the material to evaluate whether the material meets the MTCA Method B soil cleanup levels for unrestricted land use (ULU). The MTCA Method B soil cleanup levels for ULU are the Site cleanup levels specified in the CAP to protect human health via direct contact. Chemical analysis of the backfill and capping material and comparison of the analytical results to the MTCA Method B ULU criteria shall be performed prior to the contractor importing the material to the Site. If the results from a specific backfill or capping material sample indicate the presence of one or more chemicals at concentrations greater than the MTCA Method B cleanup levels, the material will not be imported for use at the Aladdin Plating Site.

3.2.2. Limits of Soil Excavation Verification

Remedial excavation will be performed at the Site to remove soil that was identified to contain metals at concentrations greater than the Site-specific cleanup standards developed in the RI and adopted in the FS that may be a source of metals leaching to groundwater. The results of chemical analyses on soil samples from borings performed at the Site identified the presence of chromium, lead, and nickel at concentrations greater than their respective Site-specific cleanup criteria. Soil sampling and analysis will be performed at the limits of the soil excavations to verify removal of soil with concentrations of chromium, lead, and nickel greater than the Site-specific cleanup criteria.

The initial limits of excavation at each area have been identified based on the results of previous investigation. Excavation will initially be performed to the limits identified in Figure 2. Field screening (i.e., visual observations) will be performed to evaluate whether additional excavation is needed to remove soil with metals concentrations greater than the Toxicity Characteristic criteria. When the initial limits of excavation have been reached, samples will be collected from the sidewalls and base (i.e., bottom) of each excavation.

Where the verification sample results are less than the Site-specific cleanup criteria, no further excavation will be performed. Where the verification sample results are greater than the criteria, additional excavation will be performed to remove soil with concentrations of cadmium or chromium greater than the criteria. Following any additional excavation, additional verification samples will be collected and analyzed to verify that the remaining soil meets the criteria. Ecology shall be notified of any additional actions (i.e., additional excavation and sampling) to be performed in response to the verification sample results.

3.2.3. Soil Stockpile Characterization for Disposal

The soil excavated from the two areas will be stockpiled for characterization prior to disposal. The stockpile area will be bermed and lined with plastic which will be secured beneath the stockpile area as well as covered with plastic. Samples of stockpiled soil removed from the two soil excavation areas will be collected and analyzed to characterize the stockpiled soil for disposal. The number of samples to be collected and analyses to be performed will be based on the landfill requirements and disposal criteria. The results from stockpiled soil sampling and analysis will be compared to landfill disposal criteria to identify the appropriate disposal location. Sampling and analysis, comparison of the sample results to landfill criteria, and acceptance of the stockpiled material by the landfill will be performed/obtained prior to transport of the stockpiled soil to a landfill for disposal.

3.3. Confirmational (Post-Construction) Monitoring

Following the completion of the remedial action, confirmational groundwater monitoring will be performed at the Site to evaluate the long-term effectiveness of the remedial action. Groundwater samples will be collected on a semi-annual basis from wells installed at the Site. The results of groundwater analyses will be evaluated based on the cleanup criteria specified in the CAP to evaluate compliance with the cleanup levels.

Monitoring wells currently present at the Site will be decommissioned as part of the remedial action to facilitate remediation activities. A replacement monitoring well will be installed at the approximate location of existing monitoring wells MW-4s/4d, and an additional location to be installed off-property to the southeast. The new wells will be installed to monitor shallow groundwater quality conditions. The proposed location of the replacement wells are shown on Figure 2.

If the monitored analytes are detected at concentrations exceeding the Site cleanup levels, additional confirmational groundwater monitoring may be performed. If additional confirmational groundwater monitoring is necessary, sampling frequency and groundwater monitoring requirements will be identified based on discussions with Ecology.

3.4. Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) requirements and procedures that will be implemented during compliance monitoring activities are presented in the Sampling and Analysis Plan (SAP) (Appendix B) and Quality Assurance Project Plan (QAPP) (Appendix C). The purpose of these documents is to describe soil and water sampling, analysis, and quality control procedures that will be implemented to produce chemical and field data that are representative, valid and accurate for use in evaluating the remedial action effectiveness.

4.0 SCHEDULE

Pending permit approvals, remediation-related construction work is scheduled to begin within 30 days of Ecology approval of the Final EDR. Remediation-related construction work is anticipated to occur over a period of 30 to 60 days beginning in September 2015.

5.0 REPORTING

Following completion of remedial action construction activities, a Remedial Action Construction Report (RACR) summarizing cleanup activities and results of confirmational monitoring will be prepared in accordance with WAC 173-340-400. The RACR will also include documentation of waste material disposal (i.e., waste manifests and disposal receipts) and as-built drawings. A draft of the RACR will be submitted to Ecology for review prior to preparation of the final RACR.

A report summarizing the results of confirmational groundwater monitoring will be prepared upon completion of each semi-annual groundwater monitoring event.

Compliance monitoring data will be provided to Ecology in the electronic format required by Ecology's Environmental Information Management Policy 840.

6.0 LIMITATIONS

We have prepared this Compliance Monitoring Plan for use by Ecology during the remedial action at the Aladdin Plating Site. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

7.0 REFERENCES

GeoEngineers, Inc., 2014. Remedial Investigation/Feasibility Study Report (RI/FS), Former Aladdin Plating Site, Tacoma, Washington. GEI File No 0504-095-00. December 10, 2014.

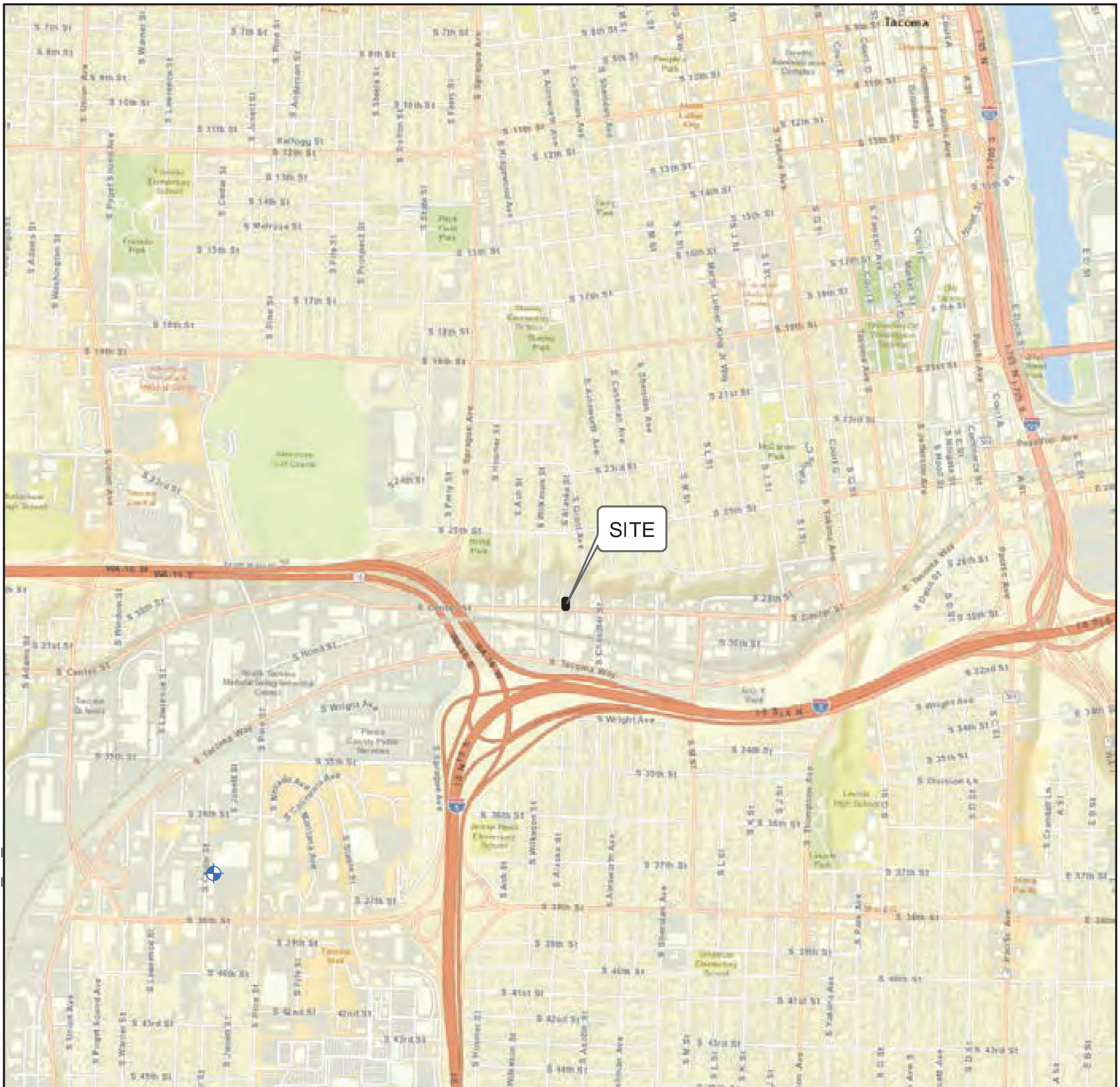
GeoEngineers, Inc., 2015. Engineering and Design Report, Former Aladdin Plating Site, Tacoma, Washington. GEI File No 0504-095-01. August 26, 2015.

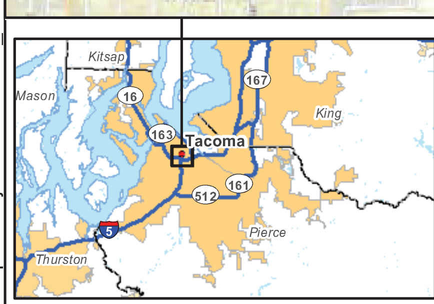
Landau Associates, 2005. Sampling and Analysis Plan, Groundwater Investigation, Former Aladdin Plating Facility, Tacoma, Washington. November 7, 2005.

Landau Associates, 2007. Cost Estimate for Additional Environmental Services, Completions of Remedial Investigation/Feasibility Study and Cleanup Action Plan, former Aladdin Plating Facility, Tacoma, Washington. April 18, 2007.

Washington State Department of Ecology 2011, Post-Interim-Action Groundwater Monitoring Results, April and October 2010, February 2011, Publication No. 11-03-016.

FIGURES





City of Tacoma production well

N
W E
S

2,000 0 2,000

Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Data Sources: ESRI Data & Maps, Street Maps 2005
Base map from ESRI Data Online.
Transverse Mercator, Zone 10 N North, North American Datum 1983
North arrow oriented to grid north

Vicinity Map

Former Aladdin Plating Facility
Tacoma, Washington

GeoEngineers

Figure 1

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Office: PORT

Map Revised: 24 July 2015 maugust

Path: \\pdx\projects\0\0504095_GIS\GIS\00\MXD\050409500_F3_OverviewofRemainingRemedial.mxd

Office: PORT

Data Source: Aerial base from ArcGIS Data Online.
Existing monitoring well locations from Landau Associates, Monitoring Well Locations and Groundwater Contours March 2007, Figure 4, 7/30/2007.

Projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Overview of Remaining Remedial Actions

Former Aladdin Plating Facility
Tacoma, Washington

GEOENGINEERS

Figure 2

APPENDICES

APPENDIX A
Health and Safety Plan

Site Health & Safety Plan (HASP)

Aladdin Plating Site Remediation Project
1657 Center Street
Tacoma, Washington

for
Washington State Department of Ecology

August 26, 2015

GeoEngineers

Plaza 600 Building
600 Stewart Street, Suite 1700
Seattle, Washington 98101
206.728.2674

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GEOENGINEERS, INC.
SITE HEALTH AND SAFETY PLAN
ALADDIN PLATING SITE REMEDIATION PROJECT
1657 CENTER STREET
TACOMA, WASHINGTON
FILE NO. 0504-095-01

This Health and Safety Plan (HASP) is to be used in conjunction with the GeoEngineers, Inc. (GeoEngineers) Safety Programs. Together, the written safety programs and this HASP constitute the site safety plan for this site. This plan is to be used by GeoEngineers personnel on this site and must be available on site. If the work entails potential exposures to other substances or unusual situations, additional safety and health information will be included, and the plan will need to be approved by the GeoEngineers Health and Safety Program Manager. Plans are to be used in conjunction with current standards and policies outlined in the GeoEngineers Health and Safety Programs.

Liability Clause: If requested by subcontractors, this site HASP may be provided for informational purposes only. In this case, Form 1 shall be signed by the subcontractor. Please be advised that this site-specific HASP is intended for use by GeoEngineers employees only. Nothing herein shall be construed as granting rights to GeoEngineers' subcontractors or any other contractors working on this site to use or legally rely on this HASP. GeoEngineers specifically disclaims any responsibility for the health and safety of any person not employed by the company.

1.0 GENERAL PROJECT INFORMATION

Project Name:	Aladdin Plating Site
Project Number:	0504-095-01
Type of Project:	Construction monitoring, soil sampling, and restoration monitoring
Start/Completion:	Remediation-related construction work is scheduled to begin within 30 days of Ecology approval of the Final Engineering Design Report and estimated to occur over a period of 1 month beginning in September 2015.
Subcontractors:	TBD

Chain of Command	Title	Name	Telephone Numbers
1	**Project Manager**	Ian Young	206.920.8635
2	**Site Safety Officer (SSO)**	Hannah McDonough	802.249.3908
3	**Health and Safety Program Manager**	Wayne Adams	253.383.4940 (o) 253.350.4387 (c)
4	**Field Personnel**	Hannah McDonough	802.249.3908
5	**Client Assigned Site Supervisor**	TBD	TBD
6	**Subcontractor(s)**	TBD	TBD
7	**Current Owner**	Pierce County	TBD

1.1. Functional Responsibility

Health and Safety Program Manager (HSM), Wayne Adams

GeoEngineers' Health and Safety Program Manager (HSM) is responsible for implementing and promoting employee participation in the program. The HSM issues directives, advisories and information regarding health and safety to the technical staff. Additionally, the HSM has the authority to audit on-site compliance with HASPs, suspend work or modify work practices for safety reasons, and dismiss from the site any GeoEngineers or subcontractor employees whose conduct on the site endangers the health and safety of themselves or others.

Project Manager (PM)

A PM is assigned to manage the activities of various projects and is responsible to the principal-in-charge of the project. The PM is responsible for assessing the hazards present at a job site and incorporating the appropriate safety measures for field staff protection into the field briefing and/or Site Safety Plan. He or she is also responsible for assuring that appropriate HASPs complying with this manual are developed. The PM will provide a summary of chemical analysis to personnel completing the HASP. PMs shall also see that their project budgets consider health and safety costs. The PM shall keep the HSM informed of the project's health- and safety-related matters as necessary. The PM shall designate the project Site Safety Officer (SSO) and help the SSO implement the specifications of the HASP. The PM is responsible for communicating information in site safety plans and checklists to appropriate field personnel. Additionally, the PM and SSO shall hold a site safety briefing before any field activities begin. The PM is responsible for transmitting health and safety information to the Site Safety Officer (SSO) when appropriate.

Site Safety Officer/HAZWOPER (SSO)

The SSO will have the on-site responsibility and authority to modify and stop work, or remove personnel from the site if working conditions change that may affect on-site and off-site health and safety. The SSO will be the main contact for any on-site emergency situation. The SSO is First Aid and CPR qualified, and Shoring, and has current Hazardous Waste Operations and Emergency Response (HAZWOPER) training. The SSO is responsible for implementing and enforcing the project safety program and safe work practices during site activities. The SSO shall conduct daily safety meetings, perform air monitoring as required, conduct site safety inspections as required, coordinate emergency medical care, and ensure personnel are wearing the appropriate personal protective equipment (PPE). The SSO shall have advanced field work experience and shall be familiar with health and safety requirements specific to the project. The SSO has the authority to suspend site activities if unsafe conditions are reported or observed.

Duties of the SSO include the following:

- Implementing the HASP in the field and monitoring compliance with its guidelines by staff.
- Being sure that GeoEngineers field personnel have met the training and medical examination requirements. Advising other contractor employees of these requirements.
- Maintaining adequate and functioning safety supplies and equipment at the site.
- Setting up work zones, markers, signs and security systems, if necessary.
- Performing or supervising air quality measurements. Communicating information on these measurements to GeoEngineers field staff and subcontractor personnel.

- Communicating health and safety requirements and site hazards to field personnel, subcontractors and contractor employees, and site visitors.
- Directing personnel to wear PPE and guiding compliance with health and safety practices in the field.
- Consulting with the PM regarding new or unanticipated site conditions, including emergency response activities. If monitoring detects concentrations of potentially hazardous substances at or above the established exposure limits, notify/consult with the PM. Consult with the PM and the HSM regarding new or unanticipated site conditions, including emergency response activities. If field monitoring indicates concentrations of potentially hazardous substances at or above the established exposure limits, the HSM must be notified and corrective action taken.
- Documenting site accidents, illnesses and unsafe activities or conditions, and reporting them to the PM and the HSM.
- Directing decontamination operations of equipment and personnel.

Field Employees

Employees working on-site that have the potential of coming in contact with hazardous substances or physical hazards are responsible for participating in the health and safety program and complying with the site specific health and safety plans. These employees are required to:

- Participate and be familiar with the health and safety program as described in this manual.
- Notify the SSO that when there is need to stop work to address an unsafe situation.
- Comply with the HASP and acknowledge understanding of the plan.
- Report to the SSO, PM or HSM any unsafe conditions and all facts pertaining to incidents or accidents that could result in physical injury or exposure to hazardous materials.
- Participate in health and safety training, including initial 40-hour Occupational Safety and Health Administration (OSHA) course, annual 8-hour HAZWOPER refresher, and First Aid/cardiopulmonary resuscitation (CPR) training.
- Participate in the medical surveillance program if applicable.
- Schedule and take a respirator fit test annually.
- Any field employee working onsite may stop work if the employee believes the work is unsafe.

Contractors Under GeoEngineers Supervision

Contractors working on the site under GeoEngineers supervision or direct control that have the potential of coming in contact with hazardous substances or physical hazards shall have their own health and safety program that is in line with the site specific health and safety plan.

1.2. List of Field Personnel and Training

Name of Employee on Site	Level of HAZWOPER Training (24-/40-hr)	Date of 8-Hr Refresher Training	First Aid/ CPR	Date of Respirator Fit Test
Ian Young	40 hr	11/18/13	7/2/14	***
Hannah McDonough	40 hr	1/29/15	1/12/13	6/18/15

*** If PELs are exceeded, the employee will leave the area until acceptable conditions are achieved.

1.3. Site Description

The Site is located at 1657 Center Street in Tacoma, Washington. The Site is currently owned by Pierce County and is being administered as an orphan site by the Washington State Department of Ecology (Ecology).

1.4. Site Map (See Attached)

1.5. Site History

The property has primarily been used for industrial activities. The Site was used historically for commercial electroplating between 1958 and 1994. Chemicals present at the Site have included chromium, nickel, lead, caustic soda, sulfuric acid, and alkaline cleaners. Aladdin Plating ceased operations in January 1994.

2.0 WORK PLAN

GeoEngineers will oversee a remedial action for the Washington State Department of Ecology's (Ecology's) Aladdin Plating Site (Site). The purpose of this remedial action is to address contamination resulting from releases of metals from past metal plating operations at the Site. As part of the remedial action, the GeoEngineers' scope includes:

- Assisting the remediation contractor in identifying and removing contaminated soil from the Site for permitted off-site disposal.
- Obtaining soil samples from the limits of excavation, obtaining soil samples from soil stockpiles, obtaining soil samples from backfill and capping material and submitting the samples to a laboratory for chemical analysis.
- Obtaining water samples during remedial excavation activities, as necessary, and submitting the samples to a laboratory for chemical analysis.
- Site capping and restoration monitoring following completion of remedial excavation activities.

2.1. List of Field Activities

Check the activities to be completed during the project:

- ☐ Job Hazard analyses (JHA) Form 3
- ☒ Site Reconnaissance
- ☐ Exploratory Borings
- ☒ Construction Monitoring
- ☐ Surveying
- ☐ Test Pit Exploration
- ☒ Soil Sample Collection
- ☒ Field Screening of Soil Samples
- ☐ Groundwater Depth and Free Product Measurement
- ☐ Vapor Measurements
- ☐ Product Sample collection
- ☒ Soil Stockpile Testing
- ☒ Remedial Excavation
- ☐ Recovery of Free Product
- ☒ Monitoring Well Installation
- ☒ Monitoring Well Development
- ☐ Underground Storage Tank (UST) Removal Monitoring
- ☐ Other: Click here to enter text.

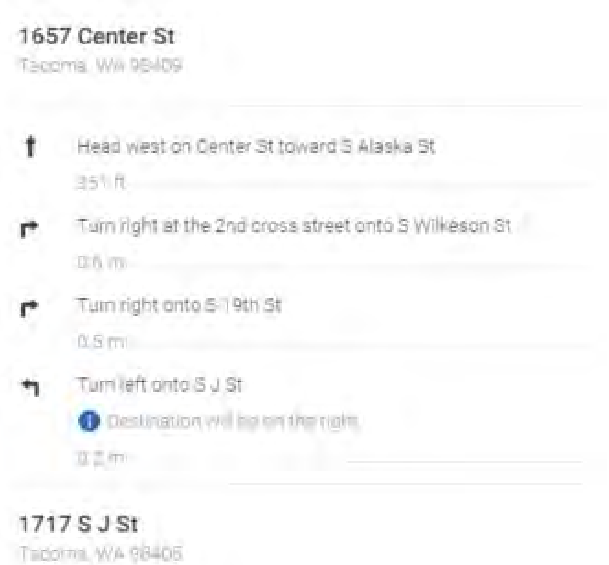
3.0 EMERGENCY INFORMATION

Hospital Name and Address: St. Joseph Hospital
1717 South J Street
Tacoma, WA 98405

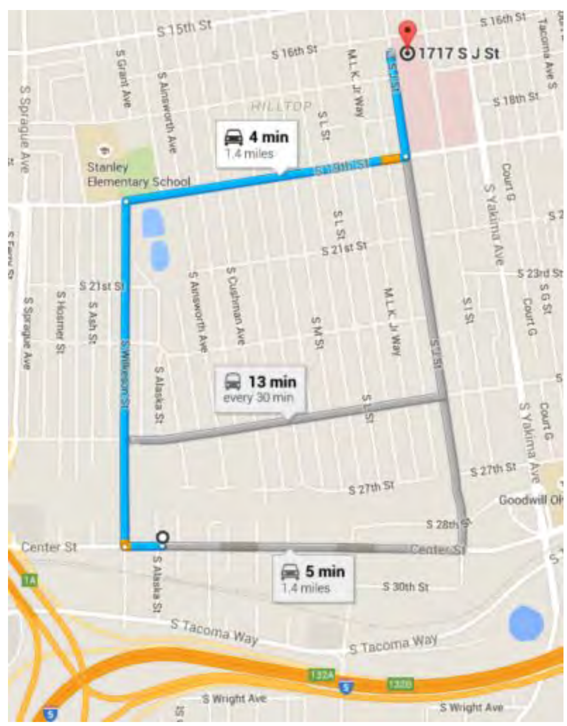
Phone Numbers (Hospital ER): **Phone**: 253.426.4101

Distance:

Route to Hospital:



Map to Hospital:



Ambulance: 9-1-1

Poison Control: Seattle (206) 253-2121; Other (800) 732-6985

Police:	9-1-1
Fire:	9-1-1
Location of Nearest Telephone:	Cell phones are carried by field personnel.
Nearest Fire Extinguisher:	Located in the GeoEngineers vehicle on-site.
Nearest First-Aid Kit:	Located in the GeoEngineers vehicle on-site.

3.1. Standard Emergency Procedures

Get help

- Send another worker to phone 9-1-1 (if necessary)
- As soon as feasible, notify GeoEngineers' Project Manager

Reduce risk to injured person

- Turn off equipment
- Move person from injury location (if in life-threatening situation only)
- Keep person warm
- Perform CPR (if necessary)

Transport injured person to medical treatment facility (if necessary)

- By ambulance (if necessary) or GeoEngineers vehicle
- Stay with person at medical facility
- Keep GeoEngineers Project Manager apprised of situation and notify Human Resources Manager of situation

4.0 HAZARD ANALYSIS

A hazard analysis has been completed as part of preparation of this HASP. The hazard analysis was performed taking into account the known and potential hazards at the site and surrounding areas, as wells as the planned work activities. The results of the hazard analysis are presented in this section. The hazard assessment will be evaluated each day before beginning work. Updates will be made as necessary and documented in the Job Hazard Analyses (JHA) Form 3 or daily field log.

The following are known applicable hazards.

4.1. Physical Hazards

☒ Drill rigs and Concrete Coring, including working inside a warehouse

☒ Backhoe

☒ Trackhoe

☐ Crane

☐ Front End Loader

☒ Excavations/trenching (1:1 slopes for Type B soil)

☒ Shored/braced excavation if greater than 4 feet of depth

☒ Overhead hazards/power lines

☒ Tripping/puncture hazards (debris on-site, steep slopes or pits)

☒ Unusual traffic hazard – Street traffic

☒ Heat/Cold, Humidity

☒ Utilities/ utility locate

☐ Noise

☐ Other: Click here to enter text.

- A utility shall be completed as required for the location to prevent drilling or digging into utilities.
- Work areas will be marked with reflective cones, barricades and/or caution tape. High-visibility vests will be worn by on-site personnel to ensure they can be seen by vehicle and equipment operators.
- Field personnel will be aware of the location and motion of heavy equipment in the area of work to ensure a safe distance between personnel and the equipment. Personnel will be visible to the operator at all times and will remain out of the swing and/or direction of the equipment apparatus. Personnel will approach operating heavy equipment only when they are certain the operator has indicated that it is safe to do so through hand signal or other acceptable means.
- Heavy equipment and/or vehicles used on this site will not work within 20 feet of overhead utility lines without first ensuring that the lines are not energized. This distance may be reduced to 10 feet, depending on the client and the use of a safety watch. Note: If it is later determined that overhead lines are a hazard on this job site, a copy the overhead lines safety section from the HASP Supplemental document shall be attached.
- Personnel entry into unshored or unsloped excavations deeper than 4 feet is not allowed. Any trenching and shoring requirements will follow guidelines established in Washington Administrative Code

(WAC) 296-155, the Washington State Construction Standards or OSHA 1926.651 Excavation Requirements. In the event that a worker is required to enter an excavation deeper than 4 feet, a trench box or other acceptable shoring will be employed or the side walls of the excavation will be sloped according to the soil type and guidelines as outlined in Department of Occupational Safety and Health (DOSH) and OSHA regulations. If the shoring/sloping deviates from that outlined in the WAC, it will be designed and stamped by a Professional Engineer (PE). Prior to entry, personnel will conduct air monitoring as described later in this plan. All hazardous encumbrances and excavated material will be stockpiled at least 2 feet from the edge of a trench or open pit. If concentrations of volatile gases accumulate within an open trench or excavation, the means of entering shall adhere to confined space entry and air monitoring procedures outlined under the air monitoring recommendations in this Plan and/or the GeoEngineers Health and Safety Programs.

- Personnel will avoid tripping hazards, steep slopes, pits and other hazardous encumbrances. If it becomes necessary to work within 6 feet of the edge of a pit, slope or other potentially hazardous area, appropriate fall protection measures will be implemented by the Site Safety Officer in accordance with OSHA/DOSH regulations and the GeoEngineers Health and Safety Program.
- Cold stress control measures will be implemented according to the GeoEngineers Health and Safety Program to prevent frost nip (superficial freezing of the skin), frost bite (deep tissue freezing), or hypothermia (lowering of the core body temperature). Heated break areas and warm beverages shall be available during periods of cold weather.
- Heat stress control measures required for this site will be implemented according to GeoEngineers Health and Safety Program with water provided on-site.

4.2. Biological Hazards and Procedures

☒ Poison Ivy or other vegetation	Hard hat, gloves and long sleeve shirt
☒ Insects or snakes	Hard hat, gloves and long sleeve shirt
☐ Hypodermic needles or other infectious hazards	Do not pick up or contact
☐ Wildlife	Click here to enter text.
☐ Other: Click here to enter text.	Click here to enter text.

4.3. Ergonomic Hazard Mitigation Measures and Procedures

Avoiding Lifting Injuries

Back injuries often result from lifting objects that are too heavy or from using the wrong lifting technique. Keep your back healthy and pain-free by following common sense safety precautions.

- Minimize reaching by keeping frequently used items within arm's reach, moving your whole body as close as possible to the object.
- Avoid overextending by standing up when retrieving objects on shelves.
- Keep your back in shape with regular stretching exercises.
- Get help from a coworker or use a hand truck if the load is too heavy or bulky to lift alone.

Proper Lifting Techniques

- Face the load; don't twist your body. Stand in a wide stance with your feet close to the object.
- Bend at the knees, keeping your back straight. Wrap your arms around the object.
- Let your legs do the lifting.
- Hold the object close to your body as you stand up straight. To set the load down, bend at the knees, not from the waist.

4.4. Engineering Controls

☒ Trench shoring (1:1 slope for Type B Soils)

☒ Location work spaces upwind/wind direction monitoring

☒ Other soil covers (as needed)

☒ Other (specify): Dust control

4.5. Chemical Hazards

CHEMICAL HAZARDS (POTENTIALLY PRESENT AT SITE)

Substance	Pathways
Metals (chromium, lead, nickel)	Soil/Water

SPECIFIC CHEMICAL HAZARDS AND EXPOSURES (POTENTIALLY PRESENT AT SITE)

Summary of Potential Metals and Chemical Hazards				
Compound/ Description	**OSHA PEL Exposure Limits/IDLH**	**NIOSH/ACGIH TLV Exposure Limits/IDLH**	**Exposure Routes**	**Toxic Characteristics**
Chromium	OSHA = TWA 1 mg/m³	NIOSH = TWA 0.5 mg/m³ IDLH 250 mg/m³ TLV-TWA = 0.5 mg/m³	Inhalation, ingestion, skin and/or eye contact	Chromium III is an essential nutrient, Chromium VI can cause irritation to nose, skin ulcers, linked to cancer.
Lead (and inorganic compounds as lead)	OSHA = TWA 0.05 mg/m³	NIOSH = TWA 0.05 mg/m³ IDLH 100 mg/m³ TLV –TWA = 0.05 mg/m³	Inhalation, ingestion, skin and/or eye contact	Lassitude (weakness, exhaustion), insomnia, facial pallor, anorexia, weight loss, malnutrition, constipation, abdominal pain, colic, anemia, gingival lead line, tremor, wrist and ankle paralysis, encephalopathy, kidney disease, irritated eyes, hypotension

Summary of Potential Metals and Chemical Hazards				
Compound/ Description	**OSHA PEL Exposure Limits/IDLH**	**NIOSH/ACGIH TLV Exposure Limits/IDLH**	**Exposure Routes**	**Toxic Characteristics**
Nickel, as Ni	OSHA = TWA 1 mg/m³	NIOSH = TWA 0.015 mg/m³ IDLH 10 mg/m³ TLV –TWA = 0.1 mg/m³	Inhalation inhalation, ingestion, skin and/or eye contact	Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]

Notes:

ppm	parts per million
mg/m3	milligrams per cubic meter
OSHA	Occupational Safety and Health Administration
ACGIH	American Conference of Governmental Industrial Hygienists
NIOSH	National Institute for Occupational Safety and Health Recommended
OSHA = TWA	Time weighted average for no more than 8 hours (OSHA)
TLV-TWA	Threshold limit value- time weighted average for no more than 8 hours (ACGIH)
NIOSH = TWA	TWA of no more than 10 hours (NIOSH)
STEL	Short term exposure limit for no more than 15 min. (OSHA, ACGIH, NIOSH)
IDLH	Immediately dangerous to life or health if exposed for more than 30 min.(NIOSH)

4.6. Additional Hazards

Additional hazards that are specific to your site should be identified here or on the Job Hazard Analyses (JHA) Form 3.

Daily field logs should include evaluation of:

- *Physical Hazards* (excavations and shoring, equipment, traffic, tripping, heat stress, cold stress and others)
- *Biological Hazards* (snakes, spiders, bees/wasps, animals, discarded needles, poison ivy, pollen, and others present)
- *Ergonomic Hazards* (lifting heavy loads, tight work spaces, etc.)
- *Chemical Hazards* (odors, spills, free product, airborne particulates and others present)

5.0 AIR MONITORING PLAN

An air monitoring plan has been prepared as part of development of this HASP. The air monitoring plan is based on the results of the chemical exposure assessment and the known and potential inhalation hazards on-site. The air monitoring plan addresses steps necessary to limit worker exposure. Non-occupational exposures are not addressed in this plan.

Work upwind if possible.

Check instrumentation to be used

☐ Multi-Gas Detector (may include oxygen, carbon monoxide, hydrogen sulfide, lower explosive limit)

☐ Dust Monitor

☒ Other (i.e., detector tubes or badges) Please specify: Photoionization Detector (PID)

Check monitoring frequency/locations and type (specify: work space, borehole, breathing zone):

☐ Continuous during soil disturbance activities or handling samples

☐ 15 minutes

☐ 30 minutes

☒ Hourly

5.1. Additional Personal Air Monitoring for Specific Chemical Exposure

Action Levels for Volatile Organic Chemicals

- The workspace will be monitored using a photoionization detector (PID). These instruments must be properly maintained, calibrated and charged (refer to the instrument manuals for details). Zero this meter in the same relative humidity as the area in which it will be used and allow at least a 10-minute warm-up prior to zeroing. Do not zero in a contaminated area.
- An initial vapor measurement survey of the site should be conducted to detect "hot spots" if contaminated soil is exposed at the surface. Vapor measurement surveys of the workspace should be conducted at least hourly or more often if persistent petroleum-related odors are detected. Additionally, if vapor concentrations exceed 5 parts per million (ppm) above background continuously for a 5-minute period as measured in the breathing zone, upgrade to Level C personal protective equipment (PPE) or move to a non-contaminated area.
- Standard industrial hygiene/safety procedure is to require that action be taken to reduce worker exposure to organic vapors when vapor concentrations exceed one-half the threshold limit value (TLV). Because of the variety of chemicals, the PID will not indicate exposure to a specific permissible exposure limit (PEL) and is therefore not a preferred tool for determining worker exposure to chemicals. If odors are detected, then employees shall upgrade to respirators with Organic Vapor cartridges and will contact the Health and Safety Program Manager for other sampling options.

AIR MONITORING ACTION LEVELS

Contaminant	Activity	Monitoring Device	Frequency of Monitoring Breathing Zone	Action Level	Action
Organic Vapors	Environmental Remedial Actions	PID	Start of shift; prior to excavation entry; every 30 to 60 minutes and in event of odors	Background to 5 ppm in breathing zone	Use Level D or Modified Level D PPE

Contaminant	Activity	Monitoring Device	Frequency of Monitoring Breathing Zone	Action Level	Action
Organic Vapors	Environmental Remedial Actions	PID	Start of shift; prior to excavation entry; every 30 to 60 minutes and in event of odors	5 to 50 ppm in breathing zone	Upgrade to Level C PPE *
Organic Vapors	Environmental Remedial Actions	PID	Start of shift; prior to excavation entry; every 30 to 60 minutes	> 50 ppm in breathing zone	Stop work and evacuate the area. Contact Health and Safety Program Manager for guidance.
Combustible Atmosphere	Environmental Remedial Actions	PID	Start of shift; prior to excavation entry; every 30 to 60 minutes	>10% LEL or >1,000 ppm	Depends on contaminant. The PEL is usually exceeded before the lower explosive limit (LEL).
Combustible Atmosphere	Environmental Remedial Actions	PID or 4-gas meter	Start of shift; prior to excavation entry; every 30 to 60 minutes	>10% LEL or >1,000 ppm	Stop work and evacuate the site. Contact Health and Safety Program Manager for guidance.
Oxygen Deficient/ Enriched Atmosphere	Environmental Remedial Actions Confined Spaces	Oxygen meter or 4-gas meter	Start of shift; prior to excavation entry; every 30 to 60 minutes	<19.5 >23.5%	Continue work if inside range. If outside range, evacuate area and contact Health and Safety Program Manager.

*Contact the HSPM and Project Manager

6.0 SITE CONTROL PLAN

Site control elements are included in the Engineering Design Report (EDR). The site control plan has been developed to minimize employee exposure to hazardous substances and includes the following. For medical assistance, see Section 3.0 above.

6.1. Traffic or Vehicle Access Control Plans

Traffic and vehicle access control plans are included in the EDR . Traffic will be controlled by the contractor with the help of road work signs and cones.

6.2. Site Work Zones

Site work zones (Construction staging areas, soil stockpile areas) are identified in the EDR. In general, hot zones/exclusion zones will be located around each excavation. Only persons with the appropriate training will enter this perimeter while work is being conducted there.

A contamination reduction zone will be established just outside the exclusion zone for the decontamination of sampling equipment. Care will be taken to prevent the spread of contamination. Equipment and personnel decontamination are discussed in the following sections, and the following types of equipment will be available to perform these activities:

- Scrub brushes;
- Spray rinse applicator;
- Plastic garbage bags; and
- Container of Alconox/water solution and Alconox powder.

Method of delineation/excluding non-site personnel

☒ Fence

☐ Survey Tape

☒ Traffic Cones

☐ Other: Click here to enter text.

6.3. Buddy System

Personnel on-site should use the buddy system (pairs), particularly whenever communication is restricted. If only one GeoEngineers employee is on site, a buddy system can be arranged with subcontractor/ contractor personnel.

6.4. Site Communication Plan

Positive communications (within sight and hearing distance or via radio) should be maintained between pairs on-site, with the pair remaining in proximity to assist each other in case of emergencies. The team should prearrange hand signals or other emergency signals for communication when voice communication becomes impaired (including cases of lack of radios or radio breakdown) and an agreed upon location for an emergency assembly area.

In instances where communication cannot be maintained, you should consider suspending work until it can be restored. If this is not an option, the following are some examples for communication:

- Hand gripping throat: Out of air, can't breathe.
- Gripping partner's wrist or placing both hands around waist: Leave area immediately, no debate.
- Hands on top of head: Need assistance.
- Thumbs up: Okay, I'm all right; or, I understand.
- Thumbs down: No, negative.

6.5. Decontamination Procedures

Decontamination consists of washing soiled boots and gloves using bucket and brush provided on-site in the contamination reduction zone. If Level C protection is being implement, outer protective Tyvek clothing, inner gloves and respirator will then be removed, hands and face will be washed in either a portable wash station or a bathroom facility in the support zone. Employees will perform decontamination procedures and wash prior to eating, drinking or leaving the Site.

Sampling equipment will be decontaminated using wet decontamination procedures:

- Wash and scrub equipment with Alconox/Liquinox and tap water solution
- Rinse with tap water
- Rinse with distilled water
- Repeat entire procedure or any parts of the procedure as necessary.

In addition to wet decontamination procedures, other measures will be taken to prevent cross contamination. These measures include changing out disposable gloves between each sampling location, using fresh paper towels at each sample location, and maintaining a clean work area. Downhole drilling equipment will be decontaminated using a hot-water, high-pressure washer. Decontamination water will be stored on-site in 55-gallon drums.

6.6. Waste Disposal or Storage

Used PPE is to be placed in a plastic bag for disposal.

Drill cutting/excavated sediment disposal or storage:

☐ On site, pending analysis and further action

☒ Secured (list method): 55-gallon drums

☒ Other (describe destination, responsible parties): Stockpiling, landfill disposal (see EDR)

7.0 PERSONAL PROTECTIVE EQUIPMENT

PPE will consist of standard Level D equipment.

Air monitoring will be conducted to determine the level of respiratory protection.

- Half-face combination organic vapor/high efficiency particulate air (HEPA) or P100 cartridge respirators will be available on-site to be used as necessary. P100 cartridges are to be used only if PID measurements are below the Site action limit. P100 cartridges are used for protection against dust, metals and asbestos, while the combination organic vapor/HEPA cartridges are protective against both dust and vapor. Ensure that the PID or TLV will detect the chemicals of concern on-site.
- Level D PPE unless a higher level of protection is required will be worn at all times on the Site. Potentially exposed personnel will wash gloves, hands, face and other pertinent items to prevent hand-to-mouth contact. This will be done prior to hand-to-mouth activities including eating, smoking, etc.
- Adequate personnel and equipment decontamination will be used to decrease potential ingestion and inhalation.

Check applicable personal protection gear to be used:

☒ Hardhat (if overhead hazards, or client requests)

☒ Steel-toed boots (if crushing hazards are a potential or if client requests)

☒ Safety glasses (if dust, particles, or other hazards are present or client requests)

☒ Reflective vest (if working near traffic or equipment)

☒ Hearing protection (if it is difficult to carry on a conversation 3 feet away)

☒ Rubber boots (if wet conditions)

Gloves (specify):

☒ Nitrile

☒ Latex

☐ Liners

☒ Leather

☐ Other (specify) Click here to enter text.

Protective clothing:

☐ Tyvek (if dry conditions are encountered, Tyvek is sufficient) (modified Level D or Level C)

☐ Saranex (personnel shall use Saranex if liquids are handled or splash may be an issue) (modified Level D or Level C)

☒ Cotton (Level D)

☒ Rain gear (as needed) (Level D)

☒ Layered warm clothing (as needed) (Level D)

Inhalation hazard protection:

☒ Level D (no respirator)

☐ Level C (respirators with organic vapor/HEPA P100 filters)

☐ Level B (Self Contained Breathing Apparatus— STOP, Consult the HSM)

7.1. Personal Protective Clothing Inspections

PPE clothing ensembles designated for use during site activities shall be selected to provide protection against known or anticipated hazards. However, no protective garment, glove or boot is entirely chemical-resistant, nor does any PPE provide protection against all types of hazards. To obtain optimum performance from PPE, site personnel shall be trained in the proper use and inspection of PPE. This training shall include the following:

- Inspect PPE before and during use for imperfect seams, non-uniform coatings, tears, poorly functioning closures or other defects. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Inspect PPE during use for visible signs of chemical permeation such as swelling, discoloration, stiffness, brittleness, cracks, tears or other signs of punctures. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Disposable PPE should not be reused after breaks unless it has been properly decontaminated.

7.2. Respirator Selection, Use and Maintenance

If respirators are required, Site personnel shall be trained before use on the proper use, maintenance and limitations of respirators. Additionally, they must be medically qualified to wear a respiratory protection in accordance with 29 CFR 1910.134. Site personnel who will use a tight-fitting respirator must have passed a qualitative or quantitative fit test conducted in accordance with an OSHA-accepted fit test protocol. Fit testing must be repeated annually or whenever a new type of respirator is used. Respirators will be stored in a protective container.

7.3. Respirator Cartridges

If Site personnel are required to wear air-purifying respirators, the appropriate cartridges shall be selected to protect personnel from known or anticipated Site contaminants. The respirator/cartridge combination shall be certified and approved by the National Institute for Occupational Safety and Health (NIOSH). A cartridge change-out schedule shall be developed based on known Site contaminants, anticipated contaminant concentrations and data supplied by the cartridge manufacturer related to the absorption capacity of the cartridge for specific contaminants. Site personnel shall be made aware of the cartridge change-out schedule prior to the initiation of Site activities. Site personnel shall also be instructed to change respirator cartridges if they detect increased resistance during inhalation or detect vapor breakthrough by smell, taste or feel, although breakthrough is not an acceptable method of determining the change-out schedule.

7.4. Respirator Inspection and Cleaning

The Site personnel shall inspect respirators prior to each use in accordance with the manufacturer's instructions. In addition, Site personnel wearing a tight-fitting respirator shall perform a positive and negative pressure user seal check each time the respirator is donned, to ensure proper fit and function. User seal checks shall be performed in accordance with the GeoEngineers respiratory protection program or the respirator manufacturer's instructions.

7.5. Facial Hair and Corrective Lenses

Site personnel with facial hair that interferes with the sealing surface of a respirator shall not be permitted to wear respiratory protection or work in areas where respiratory protection is required. Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the sealing surface of the respirator. Site personnel requiring corrective lenses will be provided with spectacle inserts designed for use with full-face respirators. Contact lenses should not be worn with respiratory protection.

8.0 ADDITIONAL ELEMENTS

8.1. Cold Stress Prevention

Working in cold environments presents many hazards to site personnel and can result in frost nip (superficial freezing of the skin), frost bite (deep tissue freezing), or hypothermia (lowering of the core body temperature).

The combination of wind and cold temperatures increases the degree of cold stress experienced by site personnel. Site personnel shall be trained on the signs and symptoms of cold-related illnesses, how the human body adapts to cold environments, and how to prevent the onset of cold-related illnesses. Heated break areas and warm beverages shall be provided during periods of cold weather.

8.2. Heat Stress Prevention

Keep workers hydrated in a hot outdoor environment requires more water be provided than at other times of the year. When employee exposure is at or above an applicable temperature listed in the Heat Stress table below, Project Managers will ensure that:

- A sufficient quantity of drinking water is readily accessible to employees at all times; and
- All employees have the opportunity to drink at least one quart of drinking water per hour.

HEAT STRESS

Type of Clothing	Outdoor Temperature Action Levels
Nonbreathing clothes including vapor barrier clothing or PPE such as chemical resistant suits	52°
Double-layer woven clothes including coveralls, jackets and sweatshirts	77°
All other clothing	89°

8.3. Emergency Response

- Personnel on-site should use the "buddy system" (pairs).
- Visual contact should be maintained between "pairs" on-site, with the team remaining in proximity to assist each other in case of emergencies.
- If any member of the field crew experiences any adverse exposure symptoms while on-site, the entire field crew should immediately halt work and act according to the instructions provided by the Site Safety and Health Supervisor.
- Wind indicators visible to all on-site personnel should be provided by the Site Safety and Health Supervisor to indicate possible routes for upwind escape. Alternatively, the Site Safety and Health Supervisor may ask on-site personnel to observe the wind direction periodically during Site activities.
- The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the field team, contact of the PM, and reevaluation of the hazard and the level of protection required.
- If an accident occurs, the Site Safety and Health Supervisor and the injured person are to complete, within 24 hours, an Accident Report for submittal to the PM, the Health and Safety Program Manager and Human Resources. The PM should ensure that follow-up action is taken to correct the situation that caused the accident or exposure.

9.0 MISCELLANEOUS

9.1. Personnel Medical Surveillance

GeoEngineers employees are not in a medical surveillance program because they do not fall into the category of “Employees Covered” in OSHA 1910.120(f)(2), which states that a medical surveillance program is required for the following employees:

(1) Employees who are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year;

(2) Employees who wear a respirator for 30 days or more a year or as required by state and federal regulations;

(3) Employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation; and

(4) Members of HAZMAT teams.

9.2. Sampling, Managing and Handling Drums and Containers

Drums and containers used during the remediation shall meet the appropriate Department of Transportation (DOT), OSHA and U.S. Environmental Protection Agency (EPA) regulations for the waste that they contain. Site operations shall be organized to minimize the amount of drum or container movement. When practicable, drums and containers shall be inspected and their integrity shall be ensured before they are moved. Unlabeled drums and containers shall be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled. Before drums or containers are moved, all employees involved in the transfer operation shall be warned of the potential hazards associated with the contents.

Drums or containers and suitable quantities of proper absorbent shall be kept available and used where spills, leaks or rupture may occur. Where major spills may occur, a spill containment program shall be implemented to contain and isolate the entire volume of the hazardous substance being transferred. Fire extinguishing equipment shall be on hand and ready for use to control incipient fires.

Drums will be fitted with secure lids to limit the potential for spills. A spill containment plan will be prepared by the selected contractor.

9.3. Entry Procedures for Tanks or Vaults (Confined Spaces)

GeoEngineers employees shall not enter confined spaces to perform work unless they have been properly trained and with hands-on experience in the use of retrieval equipment. If a project requires confined space entry, please include a copy of the confined space permit and include the training documentation in this HASP.

Trenches greater than 4 feet in depth with the potential for buildup of a hazardous atmosphere are considered confined spaces.

9.4. Sanitation

Washrooms/portable toilets will be provided by the selected contractor during work activities.

9.5. Lighting

Work is anticipated to be performed during daylight hours; artificial lighting is not anticipated to be necessary.

10.0 DOCUMENTATION TO BE COMPLETED FOR HAZWOPER PROJECTS

- Daily Field Log
- FORM 1 – Health and Safety Pre-Entry Briefing and Acknowledgment of Site Health and Safety Plan for use by employees, subcontractors and visitors
- FORM 2 – Safety Meeting Record
- FORM 3 – Job Hazard Analyses (JHA) Form
- FORM 4 – Accident/Exposure Report Form

NOTE: The Field Log is to contain the following information:

- Updates on hazard assessments, field decisions, conversations with subcontractors, client or other parties, etc.;
- Air monitoring/calibration results, including: personnel, locations monitored, activity at the time of monitoring, etc.;
- Actions taken;
- Action level for upgrading PPE and rationale; and
- Meteorological conditions (temperature, wind direction, wind speed, humidity, rain, snow, etc.).

11.0 APPROVALS

1. Plan Prepared		August 26, 2015
	Signature	Date
2. Plan Approval		August 26, 2015
	PM Signature	Date
3. Health & Safety Officer	Wayne Adams	August 26, 2015
	HSPM Signature	Date

FORM 1
HEALTH AND SAFET PRE-ENTRY BRIEFING AND ACKNOWLEDGEMENT OF THE SITE HEALTH AND SAFETY PLAN FOR GEOENGINEERS' EMPLOYEES, SUBCONTRACTORS AND VISITORS
ALADDIN PLATING SITE
FILE NO. 0504-095-01

Inform employees, contractors and subcontractors or their representatives about:

- The nature, level and degree of exposure to hazardous substances they're likely to encounter;
- Site-related emergency response procedures; and
- Any identified potential fire, explosion, health, safety or other hazards.

Conduct briefings for employees, contractors and subcontractors, or their representatives as follows:

- A pre-entry briefing before any site activity is started.
- Additional briefings, as needed, to make sure that the Site-specific HASP is followed.
- Make sure employees working on the Site are informed of any risks identified and trained on how to protect themselves and other workers against the Site hazards and risks.
- Update information to reflect current sight activities and hazards.
- Personnel participating in this project must receive initial health and safety orientation. Thereafter, brief tailgate safety meetings will be held as deemed necessary by the Site Safety Officer.
- The orientation and the tailgate safety meetings shall include a discussion of emergency response, site communications and site hazards.

(GeoEngineers' Site workers shall complete this form, which should remain attached to the HASP and be filed with other project documentation). Please be advised that this site-specific HASP is intended for use by GeoEngineers employees only. Nothing herein shall be construed as granting rights to GeoEngineers' subcontractors or any other contractors working on this site to use or legally rely on this HASP. GeoEngineers specifically disclaims any responsibility for the health and safety of any person not employed by the company.

I hereby verify that a copy of the current HASP has been provided by GeoEngineers, Inc., for my review and personal use. I have read the document completely and acknowledge an understanding of the safety procedures and protocol for my responsibilities on Site. I agree to comply with the required, specified safety regulations and procedures.

Print Name **Signature** **Date**

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FORM 2
SAFETY MEETING RECORD
ALADDIN PLATING SITE
File No. 0504-095-01

Safety meetings should include a discussion of emergency response, site communications, site hazards and mitigation measures.

- Use in conjunction with the HASP and JHA Form 3 to help identify hazards.

Date: ____________________________ **Site Safety Officer (SSO)**:__________________________________

Topics: ____

Briefly describe what was discussed:

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Attendees:

Print Name **Signature:**

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FORM 3
DAILY HAZARD ASSESSMENT FORM
ALADDIN PLATING SITE
FILE NO. 0504-095-01

This form can be used for analyses of daily hazards where there are multiple tasks and ongoing projects and for record keeping purposes. Make copies as needed.

Project: Aladdin Plating Site **File No:** 0504-095-01	**Date:** date	**Site Location:** 1657 Center Street, Tacoma, WA

Development Team:	**Position/Title:**	**Reviewed by:**	**Position/Title:**
Ian Young	Project Manager	Name	Position
Hannah McDonough	Hydrogeologist	Name	Position

Minimum Required Protective Equipment: (see critical actions for task-specific requirements)

PPE	**Equipment**	**Tools**	**Actions**
☒ Hard Hat	☐ Safety Beacons	☐ Cell Phone/Satellite	☐ Stay Visible
☒ High Visibility Vest	☐ Safety Cones	☐ Digital Camera	☐ Equipment Inspection
☒ Safety Shoes/Waders	☐ First Aid Kit	☐	☐ Work in Pairs
☒ Gloves	☐ Fire Extinguisher	☐	☒ Safety Control/Traffic Plan
☐	☐ Eye Wash/ Drinking Water	☐	☐

Job Steps	**Potential Hazards**	**Critical Actions to Mitigate Hazards**
Describe the basic steps needed to perform the task	Example: Unfamiliar locations, congestion, unpaved roads, Mechanical Failure, Flat Tires Vehicle Fire, Exhaust Leaks, Vehicle Collision, Internal Projectiles	■ Inspect the vehicle before departure: ▪ Check for tire cuts, fluid leaks, flat tires, body damage, windshield cracks, and other damage. ▪ Check lights, wipers, fluid levels, and seat belts. ■ Study the area maps, photos and use GPS and compass skills. ■ Identify the safest spot to park field vehicles.
	Pre-Job Activities	■ Example: Conduct a tail gate safety meeting discussing the jobs, the hazards and actions that will be taken to prevent injury. ■ Discuss "Stop Work Authority" as it applies to each site member. ■ Discuss appropriate PPE including high visibility clothing such as reflective vest. ■ Notify attendant and/or site owner/manager of work activities and location. ■ Discuss appropriate PPE including high visibility clothing such as reflective vest. ■ Set up exclusion zone surrounding work area.
	Other Hazards	■ Discuss additional hazard mitigation measures. ■
	Additional Hazards	■ Discuss additional hazard mitigation measures.
	Additional Hazards, i.e., Contact with overhead line and other obstacles	■ Discuss additional hazard mitigation measures.
	Additional Hazards, i.e., Slips, Trips, Falls	■ Discuss additional hazard mitigation measures.
	Additional Hazards, i.e., Sharp and/or Elevated Equipment	■ Discuss additional hazard mitigation measures.

	Additional Hazards, i.e., Heavy Equipment: Lifting/Carrying	■ Discuss additional hazard mitigation measures.
Physical Hazards	Additional Hazards, i.e., Fire/Explosion	■ Discuss additional hazard mitigation measures.
	Additional Hazards, i.e., Hearing Protection	■ Discuss additional hazard mitigation measures.
	Additional Hazards, i.e., Traffic	■ Discuss additional hazard mitigation measures.
Biological Hazards	Additional Hazards, i.e., Insects, Snakes, Wildlife, Vegetation	■ Discuss additional hazard mitigation measures.
Environmental Hazards	Additional Hazards, i.e., Hydraulic Leaks and Spills	■ Discuss additional hazard mitigation measures.
Communication	Additional Hazards, i.e., No communication in case of emergency	■ Verify cell phone is working. ■ Maintain communication with Project Manager throughout job task. ■ Verify location and contact numbers for emergency medical assistance or 911.
	Additional Hazards, i.e., Emergency	■ **Dial 911** ■ Hospital Route (Attached)

Required Control Measures: (check the box when complete)
☐ Perform a pre-work vehicle inspection (First Aid kit, fire extinguisher).
☐ Drive defensively looking out for the other guy.
☐ Conduct a pre-work safety meeting.
☐ Use a Safety Watch to monitor equipment Minimum Approach Distance (MAD) and to keep personnel clear if needed.
☐ Wear Personal Protective Equipment (PPE).
☐ Ensure training is current (First Aid, defensive driving, etc.).
☐ Conduct Task Safety Assessments throughout the job.
Additional Comments:
Click here to enter text.

DAILY HAZARD ASSESSMENT RECORD OF SAFETY MEETINGS

Signature **Date** **Signature** **Date**

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FORM 4
ACCIDENT/EXPOSURE REPORT FORM
ALADDIN PLATING SITE
File No. 0504-095-01

To (Supervisor): ______________________ From (Employee): ______________________

Telephone (with area code): ______________________

Name of injured or ill employee: ______________________________________

Date of accident: Time of accident: Exact location of accident:

Narrative description of accident/exposure (circle one):

Medical attention given on site:

Nature of illness or injury and part of body involved: Lost Time? Yes ☐ No ☐

Probably Disability (check one):

Fatal	Lost work day with days away from work	Lost work day with days of restricted activity	No lost work day	First Aid only
☐	☐	☐	☐	☐

Corrective action taken by reporting unit and corrective action that remains to be taken (by whom and when):

Employee Signature: Date:

Name of Supervisor:

ATTACHMENT
SITE MAP
ALADDIN PLATING SITE
File No. 0504-095-01

Property Boundary

Parcel Boundary (Pierce County)

N
W E
S

100 0 100

Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Data Sources: Parcel Boundary and roads from Pierce County GIS.
Base map from ESRI Data Online.
Transverse Mercator, Zone 10 N North, North American Datum 1983
North arrow oriented to grid north

Site Map	
Former Aladdin Plating Facility Tacoma, Washington	
GeoEngineers	**Figure 2**

Office: PORT Path: P:\0\0504095_GIS\GIS\00\MXD\050409500_F2_SM.mxd Map Revised: 08 January 2014 ccabrera

APPENDIX B
Sampling and Analysis Plan

Sampling and Analysis Plan (SAP)

Aladdin Plating Site Remediation Project
1657 Center Street
Tacoma, Washington

for
Washington State Department of Ecology

August 26, 2015

GeoEngineers
Earth Science + Technology

Sampling and Analysis Plan (SAP)

Aladdin Plating Site Remediation Project
1657 Center Street
Tacoma, Washington

for
Washington State Department of Ecology

August 26, 2015

GeoEngineers

Plaza 600 Building
600 Stewart Street, Suite 1700
Seattle, Washington 98101
206.728.2674

Table of Contents

LIST OF FIGURES

1.0 INTRODUCTION

This document presents the Sampling and Analysis Plan (SAP) for remedial activities at the Aladdin Plating Site (Site) located at 1657 Center Street in Tacoma, Washington (Figure 1). This SAP serves as the primary guide for standard operating procedures for soil and water sampling to be completed during the remedial action.

The remedial action is being conducted by the Washington State Department of Ecology (Ecology) to address contamination resulting from releases of metals from past metal plating operations at the Site. The objectives of the remedial action are presented in the Engineering Design Report (EDR) prepared for the Site (GeoEngineers, 2015a). Quality assurance and quality control (QA/QC) requirements for sampling and analysis to be performed at the Site are presented in the Quality Assurance Project Plan (QAPP) provided in Appendix C of the Compliance Monitoring Plan (CMP) GeoEngineers, 2015b). The site-specific Health and Safety Plan (HASP) to be used during field activities is presented in Appendix A of the CMP (GeoEngineers, 2015c).

2.0 BACKGROUND

2.1. Problem Definition

Historical metal plating operations at the Site have resulted in releases of metals to soil and groundwater. Previous analyses for metals on soil samples from borings performed at the Site identified the presence of chromium, lead, and nickel at concentrations greater than the Site cleanup levels. Additionally, Site contaminants have been detected in groundwater at concentrations greater than the Site cleanup levels.

Ecology has determined that remedial actions are warranted at the Site to reduce the potential threat to human health and the environment. The remedial actions to be performed at the Site include removing soil with chromium, lead, and nickel concentrations greater than the Site cleanup levels, and groundwater monitoring to evaluate the long-term effectiveness of the remediation action.

2.2. Site Description

The Aladdin Plating Site is centered on a corner parcel measuring approximately 100 feet long and 30 feet wide, with no building structures currently standing on the Site property. The Site property is currently unpaved and surrounded by temporary construction fencing. The Site is located on the southwestern corner of Pierce County parcel 2855000010. The immediate area surrounding the Site is primarily industrial with some residential housing, bordered to the north and east by the Bill's Towing & Garage automotive storage yard, to the west across South Alaska Street by B&D International Moving and Storage, and to the south across Center Street by Electric Construction Company.

The Site is relatively flat with an elevation change of approximately two feet across the Site. The Site surface is comprised of fill material of varying thickness. The fill material is present on top of an unconsolidated silt deposit that is underlain by deposits of sand and gravel.

Groundwater is present at the Site at depths ranging from 21 to 27 feet below ground surface (bgs). Groundwater flow is interpreted to be in a southeasterly direction.

2.3. Site History

The Site was used historically for commercial electroplating between 1958 and 1994. Chemicals used at the Site have included chromium, nickel, lead, caustic soda, sulfuric acid, and alkaline cleaners. The Site is currently owned by Pierce County and is managed by the Washington State Department of Ecology (Ecology) as an orphan site.

Several investigations have previously been performed at the Site between 2005 and 2007 by Ecology and Landau Associates to characterize Site soil and groundwater. Current Site contaminants of concern have been identified by Ecology as total chromium, hexavalent chromium, lead, and nickel in on-property soil, and total chromium, hexavalent chromium, and nickel in the shallow groundwater aquifer. Several rounds of groundwater monitoring were conducted at the Site from 2006 to 2007, including both on-property and off-property wells. The extent of Site contaminants was not defined within the context of those investigations and monitoring events.

2.4. Project Description and Schedule

Remedial activities consist of excavation and off-site disposal as well as capping of soil containing metals concentrations above Site cleanup levels. Additionally, groundwater monitoring will be performed after remedial activities are completed to verify compliance with the groundwater cleanup levels. The objective of the remedial action is to eliminate, reduce, or otherwise control to the extent feasible and practicable, unacceptable risks to human health and the environment posed by metals in soil and groundwater at the Site in accordance with Model Toxics Control Act (MTCA) ([Washington Administrative Code] WAC 173-340) and other applicable regulatory requirements.

Soil and water samples will collected as part of remedial and compliance monitoring activities for the following purposes:

- Backfill and capping material characterization;
- Limits of soil excavation verification;
- Soil stockpile characterization for disposal; and
- Confirmational groundwater monitoring.

The soil and water samples collected to support remedial activities performed at the Aladdin Plating Site will be submitted to Analytical Resources Incorporated (ARI) Laboratory in Tukwila, Washington for chemical analysis. The chemical analyses to be performed will be in accordance with the project specific requirements specified in the CAP prepared for the site (GeoEngineers, 2014) as well as requirements established for soil disposal and water discharge. The following sections describe sample collection procedures and analyses to be performed as part of remedial and confirmational groundwater monitoring activities.

Pending permit approvals, remediation-related construction work is scheduled to begin within 30 days of Ecology approval of the Final EDR. Remediation-related construction work is anticipated to occur over a period of 30 to 60 days beginning in September 2015.

3.0 SAMPLING PROCEDURES

The following sections describe the sampling procedures that will be used during remediation activities and confirmational groundwater monitoring to characterize soil and water at the Site. Project QA/QC requirements for sampling and analysis are presented in the QAPP provided in Appendix C of the CMP (GeoEngineers, 2015a).

3.1. Backfill Material Characterization

Samples of backfill and capping material will be collected and analyzed to verify that the material meets the Site cleanup levels. The Site cleanup levels specified in the CAP to protect human health via direct contact are based upon the MTCA Method B soil cleanup levels for unrestricted land use (ULU). The results from backfill material sampling and analysis will be compared to the MTCA Method B soil cleanup levels to verify that the material meets the cleanup levels. Sampling, analysis, and comparison of the sample results to the cleanup levels to verify compliance with the cleanup levels will be performed prior to the contractor importing the backfill and capping material to the Site.

The contractor selected to perform remediation activities will identify the source or sources (i.e., borrow pits, supplier facilities, etc.) that are proposed to provide backfill and capping materials. Samples of the backfill and capping materials will be collected for chemical analysis from stockpiles located at the source's facility.

Each sample of a proposed backfill material will be composed of three aliquots of the material collected from three locations around a material stockpile. At each location approximately 6 inches of material present at the surface of the stockpile will be removed prior to collecting a sample aliquot. Then an aliquot of the material will be collected using a clean (i.e., decontaminated) stainless steel spoon/trowel or directly using a clean, gloved hand (i.e., hand covered by a new nitrile glove) and placed in a clean stainless steel bowl. Three equal sized aliquots will be placed in the bowl and homogenized to prepare a backfill or capping material sample. The samples will be placed in pre-cleaned, previously unused sample jars supplied by the laboratory. The backfill and capping material samples will be labeled and placed in a cooler on ice for transport to the laboratory. Sample handling will follow appropriate chain of custody procedures from sample collection through analysis.

The backfill material samples will be analyzed for the following:

- Metals by US Environmental Protection Agency (EPA) Method 6010/7470/7471;
- Total cyanide by EPA Method 4500;
- Volatile organic compounds (VOCs) by EPA Method 8260B;
- Semi-volatile organic compounds (SVOCs) by EPA Method 8270D;
- Petroleum hydrocarbons by Northwest Methods NWTPH-G and NWTPH-Dx;
- Pesticides by EPA Method 8081A; and
- Polychlorinated biphenyls (PCBs) by EPA Method 8082B.

If the results from a specific backfill or capping material sample indicate the presence of one or more chemicals at concentrations greater than the MTCA Method B cleanup levels, the material will not be imported for use at the Aladdin Plating Site.

3.2. Limits of Soil Excavation Verification

Samples will be collected from the sidewalls and base (i.e., bottom) of the remedial excavation area to verify that soil with concentrations greater than the Site cleanup level criteria has been removed. The soil is being excavated, stockpiled, and disposed of off site as part of the remedial action. Soil sampling and analysis will be performed at the limits of the soil excavations to verify removal of soil with concentrations of chromium, lead, and nickel greater than Site cleanup level criteria.

The initial limits of excavation at each area have been identified based on the results of previous investigations. Excavation will initially be performed to the limits identified in Figure 2. Field screening (i.e., visual observations) will be performed at the initial limits of the excavation to evaluate whether additional excavation is needed to remove soil with metals concentrations greater than Toxicity Characteristic criteria prior to sample collection. The soil will be observed for physical evidence of possible contamination including unusual color, staining and/or odor. Field screening results will be recorded on field forms and the results will be used as a general guideline to delineate areas of possible contamination. When the limits of excavation have been reached based on field screening, samples will be collected from the sidewalls and bottom of each excavation.

A sample will be collected from each 20 lineal feet along each sidewall and from each 225 square feet (sf) (i.e., equivalent to 15 by 15 foot area) of excavation bottom in each excavation area. Soil samples collected from excavations that are less than approximately 4 feet in depth will be collected by field personnel by directly entering the excavation if it is safe to do so and using a clean stainless steel spoon/trowel or directly using a clean, gloved hand and placed in a clean stainless steel bowl. If it is not safe to enter an excavation, or where the excavation is deeper than 4 feet bgs, samples will be collected from material removed from the sample area by the excavation equipment and presented in the excavator bucket. Samples collected from the excavation equipment will be from material that has not come in contact with the bucket. The samples will be collected using a clean stainless steel spoon/trowel or directly using a clean, gloved hand and placed in a clean stainless steel bowl and homogenized prior to sample collection. The soil excavation verification samples will be placed in pre-cleaned, previously unused sample jars supplied by the laboratory. The samples will be labeled and placed in a cooler on ice for transport to the laboratory. Sample handling will follow appropriate chain of custody procedures from sample collection through analysis.

The soil excavation verification samples will be analyzed for the following:

- Total chromium, lead, and nickel by EPA Method 6010; and
- Toxicity characteristic leaching procedure (TCLP) chromium, lead, and nickel by EPA Method 6010

To the extent practical, the samples will be analyzed on a short turnaround basis to allow timely decision-making regarding the need for further excavation. The results of TCLP chromium, lead, and nickel analyses will be compared to the Toxicity Characteristic criteria (WAC 173-303-090). If the results for a specific sidewall or bottom sample are less than Toxicity Characteristic criteria no additional excavation will be performed. If the results for a specific sidewall or bottom sample are greater than Toxicity Characteristic criteria, additional excavation will be performed in the area represented by the sample and an additional sample or samples will be collected at the rates specified above (i.e., 20 lineal feet along each sidewall and from each of 225 sf). The additional sample results will be compared to the Toxicity Characteristic criteria to evaluate whether excavation is complete in the area represented by the sample or whether additional excavation and sampling is to be performed.

3.3. Soil Stockpile Characterization for Disposal

Samples of stockpiled soil removed from the two soil excavation areas will be collected and analyzed to characterize the stockpiled soil for disposal. The number of samples to be collected and analyses to be performed will be based on the landfill requirements and disposal criteria. The results from stockpiled soil sampling and analysis will be compared to landfill disposal criteria to identify the appropriate disposal location. Sampling and analysis, comparison of the sample results to landfill criteria, and acceptance of the stockpiled material by the landfill will be performed/obtained prior to transport of the stockpiled soil to a landfill for disposal.

The excavated soil will be stockpiled in a bermed and plastic-lined area and covered with plastic. Samples will be collected from the stockpile(s) at a frequency specified by the landfill. At each stockpile sample location approximately 6 inches of material present at the surface of the stockpile will be removed prior to collecting a sample. Then a sample of the stockpiled material will be collected using a clean, stainless steel spoon/trowel or directly using a clean, gloved hand and placed in a clean stainless steel bowl. The sample material will then be homogenized prior to sample collection. The samples will be placed in pre-cleaned, previously unused sample jars supplied by the laboratory. The samples will be labeled and placed in a cooler on ice for transport to the laboratory. Sample handling will follow appropriate chain of custody procedures from sample collection through analysis.

The stockpile samples are anticipated to be analyzed for the following:

- Total Resource Conversation and Recovery Act (RCRA) metals by EPA Method 6010.

Follow-up TCLP analyses for specific metals by EPA Method 6010 will be performed if the total metals result for a specific metal or metals exceed the 20-times rule.

The results of stockpile sample analyses will be used to identify the appropriate disposal location for the excavated soil.

3.4. Groundwater Compliance Monitoring

Following the completion of the remedial action, groundwater samples will be collected from the Site and analyzed to evaluate the long-term effectiveness of the remedial action. The groundwater samples will be collected from wells installed at the Site. The results of groundwater analyses will be evaluated based on the cleanup criteria specified in the CAP to evaluate compliance with the cleanup levels.

Monitoring wells currently present at the Site will be decommissioned as part of the remedial action. A new, replacement monitoring well will be installed at the approximate location of existing monitoring wells MW-4s/4d, and an additional well to be installed off-property to the southeast. The new wells will be installed to monitor shallow groundwater quality conditions. The proposed location of the replacement wells are shown on Figure 2.

3.4.1. Monitoring Well Construction

Drilling and construction of the replacement monitoring wells will be conducted by a Washington State licensed driller in accordance with the Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 WAC). Installation of the monitoring wells will be observed by a licensed geologist who will prepare a detailed log of the materials and depths of the wells. Monitoring well borings will be drilled using a hollow-stem auger drill rig or similar equipment. The monitoring wells are to be installed to depths of approximately 30 to 40 feet bgs. Soil cuttings from borings completed for installation of the monitoring wells will be placed in labeled and sealed 55-gallon drums. The drums will be stored temporarily at a secure location on the Site pending off-site disposal at a permitted facility.

Wells will be constructed of 2-inch-diameter, flush-threaded, Schedule 40 polyvinyl chloride (PVC) casing with machine-slotted PVC screen (0.010-inch). The screened interval will be 5-feet in length, similar to the existing wells.

Following placement of the well screen and casing in the borehole, a filter pack will be installed around the well screen. The filter pack will extend from the bottom of the well to above the top of the well screen. The filter pack material will consist of commercially prepared 10-20 silica sand. However, an alternate sand size/gradation may be used to minimize the turbidity of water entering the wells.

A bentonite annular seal will be placed above the sand pack to a depth of approximately 1-foot bgs. Each well will be completed with a concrete surface seal, and a flush-mount monument. The monument will be cemented in place from the surface to a depth of about 1-foot bgs.

The location of the new, replacement wells will be recorded using a hand-held Trimble GeoXT or similar global positioning system (GPS) unit. The GPS data will be used to provide coordinates for the new wells. The GPS data will be referenced to the Washington State Plane North Coordinate System (NAD83).

3.4.2. Monitoring Well Development

Each monitoring well will be developed to stabilize the filter pack and formation materials surrounding the well screen and restore the hydraulic connection between the well screen and the surrounding soil. The well screen interval will be gently surged with a decontaminated bailer or surge block and the well will be purged of water. Development will continue until a minimum of five casing volumes of water have been removed and turbidity of the purge water is relatively low. The removal rate and volume of groundwater removed will be recorded during well development. Water that is removed from the well during well development activities will be stored on site in labeled 55-gallon drums, pending off-site disposal. Depths to water in the monitoring wells will be measured prior to and following development.

3.4.3. Water Level Measurements

Water level measurements will be obtained at each monitoring well prior to purging and sample collection. All water levels will be measured using an electronic water level indicator and will be recorded to the nearest 0.01 foot. Measurements will be taken from the top of the well casing.

3.4.4. Groundwater Sampling and Analysis

Groundwater samples will be collected using low-flow/low-turbidity sampling techniques to minimize the suspension of sediment in the samples. The wells will be purged and groundwater samples will be obtained from the wells using a peristaltic or submersible pump and disposable polyethylene tubing. Groundwater will be purged from the wells at a rate of approximately 0.5 liters per minute or less. A Horiba U-22 (or similar) water quality measuring system with a flow-through cell will be used to monitor water quality parameters during purging including electrical conductivity, dissolved oxygen, pH, salinity, total dissolved solids, turbidity, oxidation-reduction potential, and temperature. Samples will be collected from the wells after the water quality parameters vary by less than 10 percent on three consecutive measurements. The stabilized field measurements will be documented in the field log. Following well purging, the flow-through cell will be disconnected and groundwater samples will be collected in pre-cleaned, previously unused sample bottles supplied by the laboratory. Samples collected for dissolved metals will be filtered using a 0.45 micron membrane filter. The samples will be labeled and placed in a cooler on ice for transport to the laboratory. Sample handling will follow appropriate chain of custody procedures from sample collection through analysis.

The groundwater samples will be analyzed for the following:

- Dissolved chromium, lead, and nickel by EPA Method 6010;
- Dissolved hexavalent chromium by EPA Method 6010.

The results of groundwater analyses will be evaluated based on the cleanup criteria specified in the CAP to evaluate compliance with the cleanup levels.

3.5. Sample Handling

Sample handling procedures, including sample numbering, labeling, container and preservation requirements and holding times are described in QAPP provided in Appendix C of the CMP (GeoEngineers, 2015a).

3.6. Decontamination

Non-disposable sampling equipment will be decontaminated using the procedures presented in the QAPP provided in Appendix C of the CMP (GeoEngineers, 2015a).

4.0 DISPOSAL OF INVESTIGATION-DERIVED MATERIALS

4.1.1. Soil, Groundwater and Decontamination Water

Soil cuttings from borings completed to install new, replacement groundwater monitoring wells as well as development and purge water removed from the monitoring wells and decontamination water generated during sampling activities will be placed in labeled and sealed 55-gallon drums. The drums will be temporarily stored on site at a secure location pending off-site disposal at a permitted facility. Each drum will be labeled with the following information:

- Material/media (i.e., soil) contained in the drum;
- Source of the material in the drum (i.e., locations and depths where appropriate);
- Date material was generated; and
- Name and telephone number of a contact person.

4.1.2. Disposition of Incidental Waste

Incidental waste generated during sampling activities includes items such as gloves, plastic sheeting, sample tubing, paper towels and similar expended and discarded field supplies. These materials are considered *de minimis* and will be disposed of in a local trash receptacle or county disposal facility.

5.0 QUALITY ASSURANCE AND QUALITY CONTROL

QA/QC requirements and procedures that will be implemented during the remedial action are presented in the QAPP provided in Appendix C of the CMP (GeoEngineers, 2015a). The purpose of the QAPP is to collect environmental measurements to produce data that are scientifically valid, of known and acceptable quality and that meet established objectives.

6.0 REFERENCES

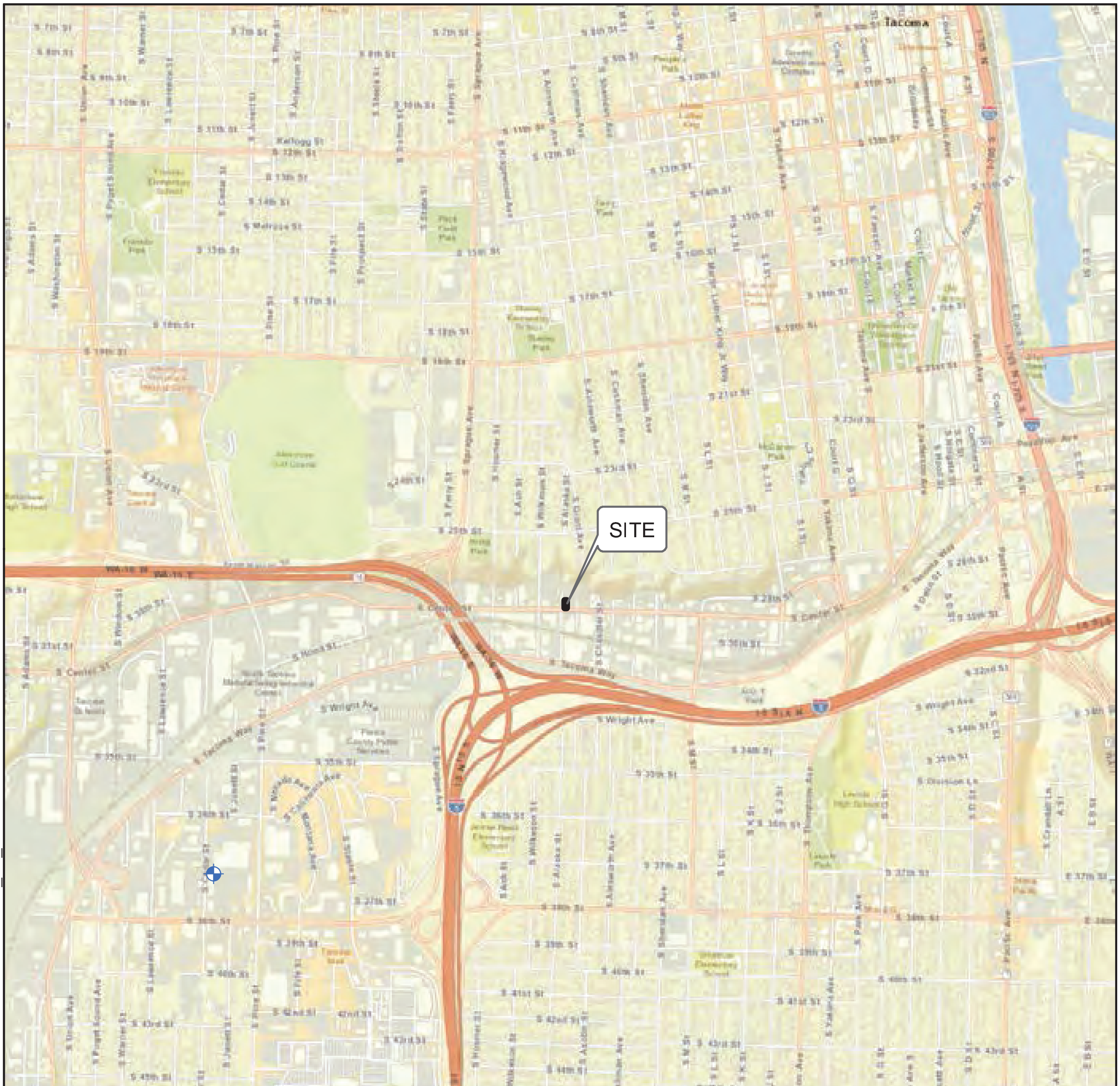
GeoEngineers, Inc. (20151a). Engineering Design Report, Former Aladdin Plating Site, 1657 Center Street, Tacoma, Washington. GEI File No. 0504-095-01, dated August 26, 2015.

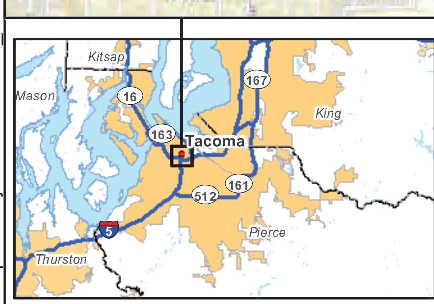
GeoEngineers, Inc. (2015b). Compliance Monitoring Plan, Former Aladdin Plating Site, 1657 Center Street, Tacoma, Washington. GEI File No. 0504-095-01, dated August 26, 2015.

GeoEngineers, Inc. (2015c). Health and Safety Plan, Former Aladdin Plating Site, 1657 Center Street, Tacoma, Washington. GEI File No. 0504-095-01, dated August 26, 2015.

GeoEngineers, Inc. (2014). Final Cleanup Action Plan, Former Aladdin Plating Site, 1657 Center Street, Tacoma, Washington. GEI File No. 0504-095-00, dated December 10, 2014.

FIGURES





City of Tacoma production well

N
W E
S

2,000 0 2,000
Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
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Data Sources: ESRI Data & Maps, Street Maps 2005
Base map from ESRI Data Online.
Transverse Mercator, Zone 10 N North, North American Datum 1983
North arrow oriented to grid north

Vicinity Map	
Former Aladdin Plating Facility Tacoma, Washington	
GeoEngineers	**Figure 1**

Path: \\pdx\Projects\0\0504095_GIS\GIS\00\MXD\050409500_F1_VM.mxd

Office: PORT

Map Revised: 24 July 2015 maugust

Office: PORT Path: \\pdx\projects\0\0504095_GIS\GIS\00\MXD\050409500_F3_OverviewofRemainingRemedial.mxd

Data Source: Aerial base from ArcGIS Data Online.
Existing monitoring well locations from Landau Associates, Monitoring Well Locations and Groundwater Contours March 2007, Figure 4, 7/30/2007.

Projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Overview of Remaining Remedial Actions

Former Aladdin Plating Facility
Tacoma, Washington

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Figure 2

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APPENDIX C
Quality Assurance Project Plan

Quality Assurance Project Plan (QAPP)

Aladdin Plating Site Remediation Project
1657 Center Street
Tacoma, Washington

for
Washington State Department of Ecology

August 26, 2015

GeoEngineers
Earth Science + Technology

Quality Assurance Project Plan (QAPP)

Aladdin Plating Site Remediation Project
1657 Center Street
Tacoma, Washington

for
Washington State Department of Ecology

August 26, 2015

GeoEngineers

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Quality Assurance Project Plan (QAPP)

Aladdin Plating Site Remediation Project Tacoma, Washington

File No. 0504-095-01

August 26, 2015

Approved By:

Signature: Date: August 26, 2015

Ian Young, Project Manager and Field Coordinator

Signature: Mark J. Lybeer Date: August 26, 2015

Mark J. Lybeer, Quality Assurance Leader

IDY:MJL:DAC:leh

GeoEngineers

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1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared for sampling and analysis to be performed as part of the remedial action at the Washington State Department of Ecology's (Ecology) Aladdin Plating Site (Site) located at 1657 Center Street (Property) in Tacoma, Washington. This QAPP serves as the primary guide for the integration of quality assurance (QA) and quality control (QC) functions into the remedial action sampling and analysis activities. The QAPP presents the objectives, procedures, organization, and specific QA/QC activities designed to achieve data quality goals established for the project. Environmental measurements will be conducted to produce data that are scientifically valid, of known and acceptable quality and that meet established objectives. QA/QC procedures will be implemented so that the precision, accuracy, representativeness, completeness and comparability (PARCC) of the data generated meet the specified data quality objectives.

The remedial action at the Site is being conducted by Ecology to address contamination resulting from releases of metals from former metals plating operations at the Site. The objectives of the remedial action are presented in the Engineering Design Report (EDR) (GeoEngineers, 2015a). Sampling procedures are outlined in the Sampling and Analysis Plan (SAP) included as Appendix B of the Compliance Monitoring Plan (CMP) (GeoEngineers, 2015b). A site-specific Health and Safety Plan (HASP) to be used for field activities is presented in Appendix A of the CMP.

2.0 BACKGROUND

2.1. Problem Definition

The Site was used historically for commercial electroplating between 1958 and 1994. Chemicals present at the Site have included chromium, nickel, lead, caustic soda, sulfuric acid, and alkaline cleaners. Releases from past metal plating operations at the Site have resulted in contamination of Site soil and groundwater, including chromium, lead, and nickel. Site impacts have been detected in groundwater up to 200 feet east-southeast of the Property.

2.2. Site Description

The Aladdin Plating Site originates at the property occupying a corner lot on the northeast corner parcel at the intersection of Center Street and South Alaska Street measuring approximately 100 feet long and 30 feet wide, with no building structures currently standing on the parcel (Figure 2).

The Property is relatively flat with an elevation change of approximately three feet across the Site. The Property surface is composed of fill material of varying thickness. The fill material is present on top of an unconsolidated silty sand deposit that is underlain by deposits of sand and gravel.

Groundwater is present at the Site at depths ranging from 21.5 to 27 feet below ground surface (bgs). Groundwater flow is interpreted to be in an east-southeast direction.

The Site is zoned by the City of Tacoma as M1-Light Industrial. This zoning allows for mixed-use, including the following: commercial businesses, parks, daycare centers, warehouses, vehicle service, and wholesale in addition to other permitted site uses (Title 13-Land Use Regulatory Code). There are no current planned uses for the Site property.

2.3. Site History

The Site was used historically for commercial electroplating between 1958 and 1994. Chemicals present at the Site have included chromium, nickel, lead, caustic soda, sulfuric acid, and alkaline cleaners. The Site is currently owned by Pierce County and is managed by Ecology as an orphan site.

Following designation of the Site as an orphan site, Ecology oversaw demolition of the former electroplating building and conducted three investigations performed at the Site from 2005 to 2007 by Ecology and Landau Associates to characterize Site soil and groundwater. The extent of Site contaminants was not defined within the context of those investigations.

Remedial investigation (RI) activities were performed in 2014 by GeoEngineers for Ecology to address data gaps identified from previous investigations (GeoEngineers, 2014a). The objective for the RI was to collect sufficient data to assess the current vertical extent of contamination in Site soil and horizontal downgradient extent of contamination in groundwater for the preparation of a feasibility study and the CAP (GeoEngineers, 2014b). The procedures specified in this SAP are to be performed during implementation of remediation activities described in the CAP.

2.4. Project Description and Schedule

Remediation activities consist of excavation and off-site disposal as well as capping of soil containing metals concentrations above Site cleanup levels. Additionally, groundwater monitoring will be performed after remediation activities are completed to verify compliance with the groundwater cleanup levels. The objective of the remedial action is to eliminate, reduce, or otherwise control to the extent feasible and practicable, unacceptable risks to human health and the environment posed by metals in soil and groundwater at the Site in accordance with (Model toxics Control Act [MTCA] WAC 173-340) and other applicable regulatory requirements.

Soil and water samples will be collected as part of remedial and compliance monitoring activities for the following purposes:

- Backfill and capping material characterization;
- Limits of soil excavation verification;
- Soil stockpile characterization for disposal;
- Water characterization prior to discharge; and
- Confirmational groundwater monitoring.

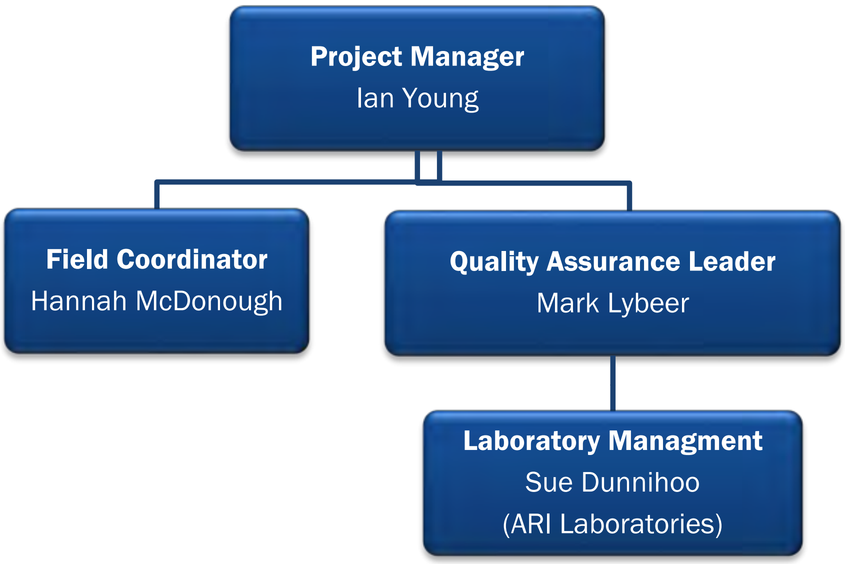
The soil and water samples collected to support remedial activities performed at the Aladdin Plating Site will be submitted to Analytical Resources Incorporated (ARI) Laboratory in Tukwila, Washington for chemical analysis. The chemical analyses to be performed will be in accordance with the project-specific requirements specified in the Cleanup Action Plan (CAP) prepared for the site (GeoEngineers, 2014b) as well as requirements established for soil disposal and water discharge.

Pending permit approvals, remediation-related construction work is scheduled to begin within 30 days of Ecology approval of the Final EDR. Remediation-related construction work is anticipated to occur over a period of 30 to 60 days beginning in September 2015.

3.0 PROJECT MANAGMENT

3.1. Project Organization and Responsibilities

Descriptions of the responsibilities, lines of authority and communication for the key positions providing QA/QC are shown in the figure below. The project organization facilitates the efficient production of project work, allows for an independent quality review, and permits resolution of any QA issues.



Project Organization Chart

3.1.1. Project Manager

Ian Young is the Project Manager and can be reached at 206.920.8635. The Project Manager has overall responsibility for executing the project in accordance with contractual requirements. The Project Manager is also responsible for selecting project team members, assigning and coordinating project tasks, determining subcontractor participation, establishing and adhering to budgets and schedules, providing technical oversight, and coordinating production and review of project deliverables.

3.1.2. Field Coordinator

Hannah McDonough is the Field Coordinator and can be reached at 802.249.3908. The Field Coordinator is responsible for the daily management of activities in the field. Specific responsibilities include the following:

- Provides technical direction to the field staff.
- Develops schedules and allocates resources for field tasks.
- Coordinates data collection activities to be consistent with information requirements.
- Supervises the compilation of field data and laboratory analytical results.
- Assures that data are correctly and completely reported.
- Implements and oversees field sampling in accordance with project plans.
- Supervises field personnel.

- Coordinates work with on-site subcontractors.
- Schedules sample shipment with the analytical laboratory.
- Monitors that appropriate sampling, testing, and measurement procedures are followed.
- Coordinates the transfer of field data, sample tracking forms, and log books to the Project Manager for data reduction and validation.
- Participates in QA corrective actions as required.

3.1.3. Quality Assurance Leader

Mark Lybeer is the QA Leader and can be reached at 206.239.3227. The QA Leader is responsible for coordinating QA/QC activities as they relate to the acquisition of field data. Specific responsibilities include the following:

- Serves as the official contact for laboratory data QA concerns.
- Reviews and approves the laboratory QA Plan.
- Responds to laboratory data QA needs, answers laboratory requests for guidance and assistance, and resolves issues.
- Monitors laboratory compliance with data quality requirements.
- Ensures that appropriate sampling, testing, and analysis procedures are followed and that proper QC checks are implemented.
- Reviews the implementation of the QAPP and the overall quality of the analytical data generated.
- Maintains the authority to implement corrective actions as necessary.

3.1.4. Laboratory Management

ARI will provide laboratory analytical services for the project. Sue Dunnihoo is the Laboratory's QA Coordinator for the project and can be reached at 206.695.6200.

The subcontracted laboratory conducting sample analyses for this project is required to obtain approval from the QA Leader before the initiation of sample analysis to assure that the laboratory QA plan complies with the project QA objectives. The Laboratory's QA Coordinator administers the Laboratory QA Plan and is responsible for QC. Specific responsibilities of this position include:

- Ensure implementation of the QA Plan.
- Serve as the laboratory point of contact.
- Activate corrective action for out-of-control events.
- Issue the final QA/QC report.
- Administer QA sample analysis.
- Comply with the specifications established in the project plans as related to laboratory services.
- Participate in QA audits and compliance inspections.

3.2. Health and Safety

A Site-specific HASP will be used for remedial action field activities and is presented in Appendix A of the CMP. The Field Coordinator will be responsible for implementing the HASP during sampling activities. The Project Manager will discuss health and safety issues with the Field Coordinator on a routine basis during the completion of field activities.

The Field Coordinator will terminate any work activities that do not comply with the HASP. Companies providing services for this project on a subcontracted basis will be responsible for developing and implementing their own HASP.

4.0 DATA QUALITY OBJECTIVES

The quality assurance objective for technical data is to collect environmental monitoring data of known, acceptable, and documentable quality. The QA objectives established for the project are:

- Implement the procedures outlined herein for field sampling, sample custody, equipment operation and calibration, laboratory analysis, and data reporting that will facilitate consistency and thoroughness of data generated.
- Achieve the acceptable level of confidence and quality required so that data generated are scientifically valid and of known and documented quality. This will be performed by establishing criteria for precision, accuracy, representativeness, completeness, and comparability, and by testing data against these criteria.

The sampling design, field procedures, laboratory procedures, and QC procedures are set up to provide high-quality data for use in this project. Specific data quality factors that may affect data usability include quantitative factors (bias, detection limits, precision, accuracy and completeness) and qualitative factors (representativeness and comparability). The measurement quality objectives (MQO) associated with the data quality factors are summarized in Table 1 and are discussed below.

4.1. Detection Limits

Analytical methods have quantitative limitations at a given statistical level of confidence that are often expressed as the method detection limit (MDL). Although results reported near the MDL provide insight to Site conditions, quality assurance dictates that analytical methods achieve a consistently reliable level of detection known as the practical quantitation limit (PQL), which is typically demonstrated with the lowest point of a linear calibration. The contract laboratory will provide numerical results for all analytes and report them as detected above the PQL or undetected at the PQL.

The reporting limits for Chemicals of Potential Concern (COPCs) for soil and water samples to be collected as part of remediation and compliance monitoring activities are presented in Tables 2 through Table 5. These reporting limits were obtained from an Ecology-certified laboratory (i.e., ARI Laboratory). The reporting limits presented in Tables 2 and 5 are the laboratory PQLs that are considered target reporting limits (TRLs) because several factors may influence final reporting limits. First, moisture and other physical conditions of soil affect detection limits. Second, analytical procedures may require sample dilutions or other practices to accurately quantify a particular analyte at concentrations above the range of the instrument. The effect is that other analytes could be reported as undetected but at a value higher than a specified TRL. Data users must be aware that high non-detect values, although correctly reported, can bias statistical summaries and careful interpretation is required to correctly characterize Site conditions.

4.2. Precision

Precision is the measure of mutual agreement among replicate or duplicate measurements of an analyte from the same sample and applies to field duplicate or split samples, replicate analyses, and duplicate spiked environmental samples (matrix spike duplicates). The closer the measured values are to each other, the more precise the measurement process. Precision error may affect data usefulness. Good precision is indicative of relative consistency and comparability between different samples. Precision will be expressed as the relative percent difference (RPD) for spike sample comparisons of various matrices and field duplicate comparisons for soil and catch basin solids and water samples.

This value is calculated by:

Where $$RPD(\%) = \frac{|D_1 - D_2|}{(D_1 + D_2)/2} X\ 100,$$

D_1 = Concentration of analyte in sample.

D_2 = Concentration of analyte in duplicate sample.

The calculation applies to split samples, replicate analyses, duplicate spiked environmental samples (matrix spike duplicates), and laboratory control duplicates. The RPD will be calculated for samples and compared to the applicable criteria. Precision can also be expressed as the percent difference (%D) between replicate analyses. Persons performing the evaluation must review one or more pertinent documents (USEPA, 1999; USEPA, 2004) that address criteria exceedances and courses of action. Project RPD goals for all analyses are 35 percent for water samples and 50 percent for soil samples, unless the primary and duplicate sample results are less than 5 times the MRL, in which case RPD goals will not apply for data quality assessment purposes.

4.3. Accuracy

Accuracy is a measure of bias in the analytic process. The closer the measurement value is to the true value, the greater the accuracy. This measure is defined as the difference between the reported values versus the actual value and is often measured with the addition of a known compound to a sample. The amount of known compound reported in the sample, or percent recovery, assists in determining the performance of the analytical system in correctly quantifying the compounds of interest. Since most environmental data collected represent one point spatially and temporally rather than an average of values, accuracy plays a greater role than precision in assessing the results. In general, if the percent recovery is low, non-detect results may indicate that compounds of interest are not present when in fact these compounds are present. Detected compounds may be biased low or reported at a value less than actual environmental conditions. The reverse is true when recoveries are high. Non-detect values are considered accurate while detected results may be higher than the true value.

For this project, accuracy will be expressed as the percent recovery of a known surrogate spike, matrix spike, or laboratory control sample (blank spike), concentration:

$$Recovery\,(\%) = \frac{Spiked\ Result - Unspiked\ Result}{Known\ Spike\ Concentration}\ X\ 100$$

Persons performing the evaluation must review one or more pertinent documents (USEPA, 1999; USEPA, 2004) that address criteria exceedances and courses of action. Accuracy criteria for surrogate spikes, matrix spikes, and laboratory control spikes are found in Table 1 of this QAPP.

4.4. Representativeness

Representativeness expresses the degree to which data accurately and precisely represent the actual Site conditions. The determination of the representativeness of the data will be performed by completing the following:

- Comparing actual sampling procedures to those delineated within the SAP and this QAPP.
- Comparing analytical results of field duplicates to determine the variations in the analytical results.
- Invalidating non-representative data or identifying data to be classified as questionable or qualitative.

Only representative data will be used in subsequent data reduction, validation, and reporting activities.

4.5. Completeness

Completeness establishes whether a sufficient amount of valid measurements were obtained to meet project objectives. The number of samples and results expected establishes the comparative basis for completeness. Completeness goals are 90 percent useable data for samples/analyses planned. If the completeness goal is not achieved an evaluation will be made to determine if the data are adequate to meet study objectives.

$$Completeness = \frac{number\ of\ valid\ measurements}{total\ number\ of\ data\ points\ planned}\ x\ 100$$

4.6. Comparability

Comparability expresses the confidence with which one set of data can be compared to another. Although numeric goals do not exist for comparability, a statement on comparability will be prepared to determine overall usefulness of data sets, following the determination of both precision and accuracy.

4.7. Holding Times

Holding times are defined as the time between sample collection and extraction, sample collection and analysis, or sample extraction and analysis. Some analytical methods specify a holding time for analysis only. For many methods, holding times may be extended by sample preservation techniques in the field. If a sample exceeds a holding time, then the results may be biased low. For example, if the extraction holding time for volatile analysis of soil sample is exceeded, then the possibility exists that some of the organic constituents may have volatilized from the sample or degraded. Results for that analysis would be qualified as estimated to indicate that the reported results may be lower than actual Site conditions. Holding times are presented in Table 6.

4.8. Blanks

According to the *National Functional Guidelines for Organic Data Review* (USEPA, 1999), "The purpose of laboratory (or field) blank analysis is to determine the existence and magnitude of contamination resulting from laboratory (or field) activities. The criteria for evaluation of blanks apply to any blank associated with the samples (e.g., method blanks, instrument blanks, trip blanks, and equipment blanks)." Trip blanks are placed with samples during shipment and travel with samples from the laboratory to the field and back to the laboratory. Method blanks are created during sample preparation and follow samples throughout the analysis process.

Analytical results for blanks will be interpreted in general accordance with *National Functional Guidelines for Organic Data Review* (USEPA, 1999) and professional judgment.

4.9. Special Training Requirements/Certification

The Superfund Amendments and Reauthorization Act of 1986 required the Secretary of Labor to issue regulations providing health and safety standards and guidelines for workers engaged in hazardous waste operations. Occupational Safety and Health Administration (OSHA) regulations (29 CFR 1910.120) require training to provide employees with the knowledge and skills necessary to enable them to perform their jobs safely and with minimum risk to their personal health. All sampling personnel will have completed the 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and 8-hour refresher courses, as necessary, to meet OSHA regulations.

5.0 DOCUMENTATION AND RECORDS

5.1. Field observations

Field documentation provides important information about potential problems or special circumstances surrounding sample collection. Field personnel will maintain daily field logs. The field logs will be prepared on field report forms or in a bound logbook. Entries in the field logs and associated sample documentation forms will be made in waterproof ink, and corrections will consist of line-out deletions that are initialed and dated. Individual logbooks will become part of the project files at the conclusion of the field work.

At a minimum, the following information will be recorded during the collection of each sample.

- Sample location and description
- Site or sampling area sketch showing sample location and measured distances
- Sampler's name(s)
- Date and time of sample collection
- Designation of sample as composite or discrete
- Sample matrix (soil or water)
- Type of sampling equipment used
- Field instrument (e.g., PID) readings

- Field observations and details that are pertinent to the integrity/condition of the samples (e.g., weather conditions, performance of the sampling equipment, sample depth control, sample disturbance, etc.)
- Preliminary sample descriptions (e.g., lithology, field screening results)
- Sample preservation
- Sample transport/shipping arrangements
- Name of recipient laboratory

In addition to the sampling information, the following specific information also will be recorded in the field log for each day of sampling.

- Sampling team members
- Time of arrival/entry on Site and time of Site departure
- Other personnel present at the Site
- Summary of pertinent meetings or discussions with regulatory agency or contractor personnel
- Deviations from sampling plans, QAPP procedures, and HASP
- Changes in field personnel and responsibilities with reasons for the changes
- Levels of safety protection
- Calibration readings for any field instruments used

The handling, use, and maintenance of field log books are the Field Coordinator's responsibility.

5.2. Analytical Chemistry Records

Laboratories will be responsible for internal checks on data reporting and will correct errors identified during the QA review. All laboratories must be accredited by Ecology for the required analytical methods. Close contact will be maintained with the laboratories to resolve any quality control problems in a timely manner. The laboratories will be required to provide the following:

- **Project Narrative –** This summary, in the form of a cover letter, will present any problems encountered during any aspect of analysis. The summary will include, but not be limited to, a discussion of QC, sample shipment, sample storage, and analytical difficulties. Any problems encountered by the laboratory, and their resolutions, will be documented in the project narrative.
- **Records –** Legible copies of the chain-of-custody (COC) forms will be provided as part of the data package. This documentation will include the time of receipt and the condition of each sample received by the laboratory. Additional internal tracking of sample custody by the laboratory will also be documented.
- **Sample Results –** The data package will summarize the results for each sample analyzed. The summary will include the following information, as applicable:
    - Field sample identification code and the corresponding laboratory identification code
    - Sample matrix
    - Date of sample extraction/digestion

- Date and time of analysis
- Weight and/or volume used for analysis
- Final dilution volumes or concentration factor for the sample
- Total solids in the samples
- Identification of the instruments used for analysis
- MDLs and RLs
- All data qualifiers and their definitions

- **QA/QC Summaries –** These summaries will contain the results of all QA/QC procedures. Each QA/QC sample analysis will be documented with the same information as that required for the sample results (see above). The laboratory will make no recovery or blank corrections. The required summaries are listed below.
  - The calibration data summary will contain the concentrations of the initial calibration and daily calibration standards and the date and time of analysis. The response factor, percent standard deviation (%RSD), RPDs, and retention time for each analyte will be listed, as appropriate. Results for standards analyzed at the RL to determine instrument sensitivity will be reported.
  - The internal standard area summary will report the internal standard areas, as appropriate.
  - The method blank analysis summary will report the method blank analysis associated with each sample and the concentrations of all compounds of interest identified in these blanks.
  - The surrogate spike recovery summary will report all surrogate spike recovery data for organic analyses. The names and concentrations of all compounds added, percent recoveries, and QC limits will be listed.
  - The matrix spike (MS) recovery summary will report the MS or MS duplicate (MSD) recovery data for analyses, as appropriate. The names and concentrations of all compounds added, percent recoveries, and QC limits will be included in the data package. The RPD for all MS/MSD analyses will be reported.
  - The laboratory replicate summary will report the RPD for all laboratory replicate analyses. The QC limits for each compound or analyte will be listed.
  - The laboratory control sample (LCS) analysis summary will report the results of the analyses of the LCS. The QC limits for each compound or analyte will be included in the data package.
  - The relative retention time summary will report the relative retention times for the primary and confirmational columns of each analyte detected in the samples, as appropriate.

EQuIS four-file format electronic data deliverables will be obtained from the laboratory and data will be submitted into Ecology's Environmental Information Management (EIM) system after data quality assessments are completed.

5.3. Data Reduction

Data reduction is the process by which original data are converted or reduced to a specified format or unit to facilitate the analysis of the data. For example, a final analytical concentration may need to be calculated from a diluted sample result. Data reduction requires that all aspects of sample preparation that could affect the test result, such as sample volume analyzed or dilutions required, be taken into account in the final result. The laboratory personnel will reduce the analytical data for review by the Quality Assurance Leader and Project Manager.

During chemical analysis, samples are occasionally diluted after the initial analysis if the estimated concentration curve for one or more of the target analytes is above the calibration curve. In these instances, concentrations from the initial analysis will be identified as the "best result" for all target analytes other than the chemical(s) that was originally above the calibration range. The "best result" for this qualified analyte(s) will be taken from the diluted sample.

6.0 DATA GENERATION AND ACQUISITION

6.1. Sample Process Design

The following sections describe the sampling process design that will be used during cleanup activities and groundwater compliance monitoring to characterize soil and water at the Site.

6.2. Backfill and Capping Material Characterization

Samples of backfill and capping material will be collected and analyzed to verify that the material meets the Site cleanup levels. Samples of the backfill and capping materials will be collected from stockpiles located at the source's facility. Each sample of a proposed backfill or capping material will be comprised of three aliquots of the material collected from three locations around a material stockpile. At each location approximately 6 inches of material present at the surface of the stockpile will be removed prior to collecting a sample aliquot. Then an aliquot of the material will be collected using a clean (i.e., decontaminated) stainless steel spoon/trowel or directly using a clean, gloved hand (i.e., hand covered by a new nitrile glove) and placed in a clean stainless steel bowl. Three equal sized aliquots will be placed in the bowl and homogenized to prepare a backfill or capping material sample.

6.3. Limits of Soil Excavation Verification

Samples will be collected from the sidewalls and base (i.e., bottom) of two remedial excavation areas to verify that soil with concentrations greater than the Toxicity Characteristic criteria has been removed. When the limits of excavation have been reached based on field screening, samples will be collected from the sidewalls and bottom of each excavation. A sample will be collected from each 20 lineal feet along each sidewall and from each 225 square feet (sf) (i.e., equivalent to 15 by 15 foot area) of excavation bottom in each excavation area. Soil samples collected from excavations that are less than approximately 4 feet in depth will be collected by field personnel by directly entering the excavation if it is safe to do so and using a clean stainless steel spoon/trowel or directly using a clean, gloved hand and placed in a clean stainless steel bowl. If it is not safe to enter an excavation, or where the excavation is deeper than 4 feet bgs, samples will be collected from material removed from the sample area by the excavation equipment and presented in the excavator bucket. The samples will be collected using a clean stainless steel spoon/trowel or directly using a clean, gloved hand and placed in a clean stainless steel bowl and homogenized prior to sample collection.

6.4. Soil Stockpile Characterization for Disposal

Samples of stockpiled soil removed from the two soil excavation areas will be collected and analyzed to characterize the stockpiled soil for disposal. At each stockpile sample location approximately 6 inches of material present at the surface of the stockpile will be removed prior to collecting a sample. Then a sample of the stockpiled material will be collected using a clean, stainless steel spoon/trowel or directly using a clean, gloved hand and placed in a clean stainless steel bowl. The sample material will then be homogenized prior to sample collection.

6.5. Confirmational Groundwater Monitoring

Following the completion of the remedial action, groundwater samples will be collected from the Site and analyzed to evaluate the long-term effectiveness of the remedial action. The groundwater samples will be collected from wells installed at the Site. The new wells will be installed to monitor shallow groundwater quality conditions, replacing monitoring wells that will be decommissioned as a result of remedial excavation. Groundwater samples will be collected from monitoring wells using submersible or peristaltic pumps and low-flow sampling procedures.

6.6. Sample Methods

6.6.1. Sampling Equipment and Decontamination Procedures

Soil samples will be collected using excavation equipment (i.e., excavator) and/or hand tools including stainless steel spoons and stainless steel mixing bowls. Samples of storm water and dewatering water would be collected directly into the sample bottles from a discharge port on a tank or from within the tank or containment structure using a poly water bailer. Groundwater samples will be collected from monitoring wells using submersible or peristaltic pumps and low-flow sampling procedures.

Reusable sampling equipment that comes in contact with soil or water will be decontaminated before each use. Decontamination procedures for this equipment will consist of the following:

1. Washing with a brush and non-phosphate detergent solution (e.g., Liqui-Nox and distilled water);
2. Rinsing with distilled water; and
3. Wrapping or covering the decontaminated equipment with aluminum foil. Field personnel will limit cross-contamination by changing gloves between sampling locations.

Wash water used to decontaminate the reusable sampling equipment will be collected and stored on site in 55-gallon drums.

6.6.2. Field Screening Procedures

The potential presence of contamination in soil samples will be evaluated using field screening techniques. Field screening results will be recorded on the field logs and the results will be used as a general guideline to delineate areas of possible contamination. Visual screening methods consisting of observations for unusual color and/or staining indicative of possible contamination will be used during the remedial action.

6.6.3. Sample Containers and Labeling

The Field Coordinator will establish field protocol to manage field sample collection, handling, and documentation. Soil and water samples will be placed in appropriate laboratory-prepared containers. Sample containers and preservatives are listed in Table 7.

Sample containers will be labeled with the following information at the time of sample collection:

- Project name and number

- Type of sample preservative used (where applicable)
- Sample identification, which will include a reference to date and sampling depth (if applicable)
- Date and time of collection

The sample collection activities will be noted in the field log books. The Field Coordinator will monitor consistency between sample containers/labels, field log books, and chain-of-custody (COC) forms.

6.7. Sample Handling and Custody

6.7.1. Sample Storage

Samples will be placed in a cooler with ice after they are collected. The objective of the cold storage will be to attain a sample temperature of 2 to 6 degrees Celsius. Holding times (Table 7) will be observed during sample storage.

6.7.2. Sample Shipment

Samples will be transported and delivered to the analytical laboratory in the sample coolers. The samples will either be transported by field personnel, laboratory personnel, or by courier service. The Field Coordinator will ensure that the cooler has been properly secured using clear plastic tape and custody seals.

6.7.3. Chain-of-Custody (COC) Records

Field personnel are responsible for the security of samples from the time the samples are collected until the samples have been received by the courier service or laboratory personnel. A COC form will be completed for each group of samples being shipped to the laboratory. Information to be included on the COC form includes:

- Project name and number;
- Sample identification numbers;
- Date and time of sampling;
- Sample matrix (soil and water), preservative, and number of containers for each sample;
- Analyses to be performed;
- Names of sampling personnel;
- Project manager name and contact information including phone number; and
- Shipping information including shipping container number, if applicable.

The original COC form will be signed by a member of the field team. Field personnel will retain copies and place the original and remaining copies in a plastic bag. The plastic bag containing the COC form will be placed in the cooler before sealing the cooler for transport to the laboratory.

6.7.4. Laboratory Custody Procedures

The laboratory will follow their standard operating procedures (SOPs) to document sample handling from time of receipt (sample log-in) to reporting. Documentation will include, at a minimum, the analyst's name or initials, time, and date.

6.8. Analytical Methods

The methods of chemical analysis are identified in Tables 2 and 5. All methods selected represent standard methods used for the analysis of these analytes in soil and water. The laboratory project manager will determine the remedy to be used if the project RLs cannot be attained, in consultation with the Quality Assurance Leader.

6.9. Quality Control

Table 8 summarizes the types and frequency of QC samples to be analyzed, including both field QC and laboratory QC samples.

6.9.1. Field Quality Control

Field QC samples serve as a control and check mechanism to monitor the consistency of field sampling methods and the potential influence of off-site factors on project samples. Examples of off-site factors include airborne VOCs and contaminants that may be present in potable water used during drilling activities. Table 7 summarizes the types and frequency of field QC samples to be analyzed and the following sections discuss field QC samples.

6.9.1.1. Field Duplicates

Field duplicates serve as a measure for precision. Under ideal field conditions, field duplicates (sometimes referred to as splits), are created by thoroughly mixing a volume of the sample matrix, placing aliquots of the mixed sample in separate containers, and identifying one of the aliquots as the primary sample and the other as the duplicate sample. Field duplicates measure the precision and consistency of laboratory analytical procedures and methods, as well as the consistency of the sampling techniques used by field personnel.

One field duplicate will be collected for every ten soil samples. For groundwater, one field duplicate will be collected for every sampling event given that less than ten samples will be collected as part of each sampling event.

6.9.1.2. Trip Blanks

Trip blanks accompany samples for volatile organic compound (VOC) analysis during field sampling and delivery to the laboratory. Trip blanks typically are analyzed at a rate of one trip blank per cooler containing samples for VOC analysis. Trip blanks will be analyzed for soil samples collected to characterize backfill and capping material during this investigation.

6.10. Laboratory Quality Control

Laboratory QC procedures will be evaluated through a formal data quality assessment process. The analytical laboratory will follow standard analytical method procedures that include specified QC monitoring requirements. These requirements will vary by method, but generally include:

- Method blanks
- Internal standards
- Instrument calibrations
- Matrix spike/matrix spike duplicates (MS/MSD)

- Laboratory control samples/laboratory control sample duplicates (LCS/LCSD)
- Laboratory replicates or duplicates
- Surrogate/Labeled compounds

6.10.1. Laboratory Blanks

Laboratory procedures utilize several types of blanks, but the most commonly used blanks for QC monitoring are method blanks. Method blanks are laboratory QC samples that consist of either a soil-like material having undergone a contaminant destruction process, or reagent (contaminant-free) water. Method blanks are extracted and analyzed with each batch of environmental samples undergoing analysis. If a substance is detected in a method blank, then one (or more) of the following occurred:

- Sample containers, measurement equipment, and/or analytical instruments were not properly cleaned and contained contaminants.
- Reagents used in the process were contaminated with a substance(s) of interest.

It is difficult to determine which of the above scenarios took place if blank contamination occurs. However, it is assumed that the conditions that affected the blanks also likely affected the project samples. If target analytes are detected in method blanks, data validation guidelines assist in determining which substances in project samples are considered "real," and which ones are attributable to the analytical process. Furthermore, the guidelines state, ". . . there may be instances where little or no contamination was present in the associated blank, but qualification of the sample is deemed necessary. Contamination introduced through dilution water is one example."

6.10.2. Calibrations

Several types of instrument calibrations are used, depending on the analytical method, to assess the linearity of the calibration curve and assure that the sample results reflect accurate and precise measurements. The main calibrations used are initial calibrations, daily calibrations, and continuing calibration verification.

6.10.3. Matrix Spike/Matrix Spike Duplicates (MS/MSD)

MS/MSD samples are used to assess influences or interferences caused by the physical or chemical properties of the sample itself. For example, extreme pH can affect the results for semivolatile organic compounds. Or, the presence of a particular compound may interfere with accurate quantitation of another analyte. MS/MSD data is reviewed in combination with other QC monitoring data to determine matrix effects. In some cases, matrix effects cannot be determined due to dilution and/or high levels of related substances in the sample. A matrix spike is evaluated by spiking a project sample with a known amount of one or more of the target analytes, ideally at a concentration that is 5 to 10 times higher than the sample result. A percent recovery is then calculated by subtracting the un-spiked sample result from the spiked sample result, dividing by the known concentration of the spike, and multiplying by 100.

MS/MSD samples will be analyzed at a frequency of one MS/MSD per analytical batch. The samples for the MS/MSD analyses should be collected from a sampling location that is believed to have only low-level contamination. A sample from an area of low-level contamination is needed because the objective of MS/MSD analyses is to determine the presence of matrix interferences, which can best be achieved with low levels of contaminants. Additional sample volume will be collected for the MS/MSD analyses as required by the laboratory.

6.10.4. Laboratory Control Sample/ Laboratory Control Sample Duplicates (LCS/LCSD)

Also known as blanks spikes, laboratory control samples (LCS) are similar to MS samples in that a known amount of one or more of the target analytes are spiked into a prepared sample medium, and a percent recovery of the spiked substances is calculated. The primary difference between LCS and MS samples is that the LCS uses a contaminant-free sample medium. For example, reagent water is typically used for LCS water analyses. The purpose of an LCS is to help assess the overall accuracy and precision of the analytical process including sample preparation, instrument performance, and analyst performance.

6.10.5. Laboratory Replicates/Duplicates

Laboratories utilize MS/MSDs, LCS/LCSDs, and/or replicates to assess precision. Replicates are a second analysis of a field-collected environmental sample. Replicates can be split at varying stages of the sample preparation and analysis process and most commonly consist of a second analysis on the extracted media.

6.10.6. Surrogates/Labeled Compounds

Surrogate spikes are used to verify proper extraction procedures and the accuracy of the analytical instrument. Surrogates are substances with characteristics similar to the target analytes. A known concentration of surrogate is added to the project sample and passed through the instrument and the percent recovery is calculated. Each surrogate used has acceptance limits (i.e., an acceptable range) for percent recovery. If a surrogate recovery is low, sample results may be biased low and depending on the recovery value, a possibility of false negatives may exist. Conversely, when recoveries are above the specified acceptance limits, a possibility of false positives exist, although non-detect results are considered accurate.

6.11. Instrument Testing, Inspection and Maintenance

The field coordinator will be responsible for overseeing the testing, inspection, and maintenance of all field equipment. The laboratory project manager will be responsible for laboratory equipment testing, inspection, and maintenance requirements. The calibration methods used in calibrating the analytical instrumentation are described in the following section.

6.12. Instrument Calibration and Frequency

6.12.1. Field Instrumentation

Field instrument calibration and calibration checks facilitate accurate and reliable field measurements. The calibration of field instruments used on the project will be checked and adjusted as necessary in general accordance with the manufacturer's recommendations. Methods and intervals of calibration checks and instrument maintenance will be based on the type of instrument, stability characteristics, required accuracy, intended use, and environmental conditions. The basic calibration check frequencies are described below.

6.12.2. Laboratory Instrumentation

For chemical analytical testing, calibration procedures will be performed in general accordance with the analytical methods used and the laboratory's SOPs. Calibration documentation will be retained at the laboratory.

All instrument calibrations and their appropriate chemical standards are to comply with the specific methods within EPA SW-846, Test Methods for Evaluating Solid Waste, Physical and Chemical Methods, 3rd Edition, December 1996 and the Laboratory SOPs. Calibration documentation, initial (ICALs) and continuing (CCALs), will be retained at the Laboratory.

6.13. Inspection of Supplies and Consumables

Supplies and consumables for the field sampling effort will be inspected upon delivery and accepted if the condition of the supplies is satisfactory. For example, jars will be inspected to ensure that they are the correct size and quantity and were not damaged in shipment.

6.14. Data Management

Laboratories will report data in formatted hardcopy and digital formats. Analytical laboratory measurements will be recorded in standard formats that display, at a minimum, the field sample identification, the laboratory identification, reporting units, data qualifiers, analytical method, analyte tested, analytical result, extraction and analysis dates, and quantitation limits. Each sample delivery group will be accompanied by sample receipt forms and a case narrative identifying data quality issues. Laboratory electronic data deliverable (EDD) requirements will be established by GeoEngineers, Inc. with the contract laboratory. The laboratory will send final analytical testing results to the Project Manager.

Following completion of the remedial action and post-construction monitoring, the relevant data generated as part of the project will be reported to Ecology as required by the Consent Decree.

7.0 ASSESSMENT AND OVERSIGHT

7.1. Assessment and Response Actions

7.1.1. Review of Field Documentation and Laboratory Receipt Information

Documentation of field sampling data will be reviewed periodically for conformance with project QC requirements described in this QAPP. At a minimum, field documentation will be checked for proper documentation of the following:

- Sample collection information (date, time, location, matrices, etc.);
- Field instruments used and calibration data;
- Sample collection protocol;
- Sample containers, preservation, and volume;
- Field QC samples collected at the frequency specified;
- COC protocols; and

- Sample shipment information.

Sample receipt forms provided by the laboratory will be reviewed for QC exceptions. The final laboratory data package will describe (in the case narrative) the effects that any identified QC exceptions have on data quality. The laboratory will review transcribed sample collection and receipt information for correctness prior to delivering the final data package.

7.1.2. Response Actions for Field Sampling

The Field Coordinator, or a designee, will be responsible for correcting equipment malfunctions throughout the field sampling effort and resolving situations in the field that may result in nonconformance or noncompliance with the QAPP. All corrective measures will be documented in the field logbook.

7.1.3. Corrective Action for Laboratory Analyses

Laboratories are required to comply with their current written standard operating procedures. The laboratory project manager will be responsible for ensuring that appropriate corrective actions are initiated as required for conformance with this QAPP. All laboratory personnel will be responsible for reporting problems that may compromise the quality of the data to the laboratory project manager. A narrative describing the anomaly, the steps taken to identify and correct it and the treatment of the relevant sample batch (i.e., recalculation, reanalysis, and re-extraction) will be submitted with the data package.

8.0 DATA VALIDATION AND USABILITY

8.1. Data Review, Verification and Validation

The data validation and usability elements of the QAPP as detailed below address the QA/QC activities that occur after data collection and/or data generation is complete. Implementation of these elements ensures that the data conform to the specified criteria and will achieve the project objectives

The data are not considered final until validated. All data, including laboratory and field QC sample results, will be summarized in a data validation report. The data validation report will focus on data that did not meet the MQOs specified in Table 1. The data validation reports will be included as an appendix to the Remedial Action Construction Report. The data report will also describe any deviations from this QAPP and actions taken to address those deviations.

Level III laboratory data packages will be obtained for all soil and water samples. These data will be reviewed for the following QC parameters:

- Holding times and sample preservation
- Method blanks
- MS/MSD analyses
- LCS/LCSD analyses
- Surrogate spikes
- Duplicates/replicates
- Field/Lab duplicates

- Calibrations (Initial and Continuing)
- Internal Standards
- Instrument Tunes

In addition to these QC parameters, other documentation such as sample receipt forms and case narratives will be reviewed to evaluate laboratory QA/QC.

8.2. Verification and Validation Methods

Hard-copy laboratory reports will be generated providing the analysis-specific information including final sample analytical results, reportable field and laboratory QA/QC analytical results, MDLs and MRLs. The laboratory data will also be reported via electronic media using the tabular outputting capabilities of standard software formats.

The term "reporting limit" will be used interchangeably with "quantitation limit" to mean the lowest concentration at which an analyte can be quantified subject to the quality control criteria of the analytical method. These terms are different from "MDL," which refers to the lowest concentration that the analytical method can ideally detect.

Data validation qualifiers including "U," "J,", and "R" will be used following the reported laboratory results to explain data quality issues affecting the laboratory data to the data user. These qualifiers are explained as follows:

- "U" indicates that a compound was analyzed for but not detected. The associated numerical value is the estimated sample quantitation limit, which is corrected for dilution and percent moisture.
- "J" indicates that a compound was detected below the reporting limit and the value is estimated or the value was estimated by the validator because of the instrument bias reasons.
- If any target analytes are found in a laboratory method blank, it will be regarded as blank contamination. In these cases, the result of a given analyte in the method blank will be compared to any positive result of the same analyte in the associated field samples. If a field sample result is less than five times (ten times for common laboratory contaminants like acetone, phthalates, etc.) the result that is reported in the method blank, the result will be considered blank contamination. Accordingly, the result will be qualified as not-detected "U" at the elevated reporting limit.
- If there are two analyses reported by the laboratory for one sample (as in the case of dilutions), the validator will make a decision as to which analysis to use in the final assessment. As there should be only one reported result per analyte for a given sample, any extraneous results will be qualified as not-reportable "R" and will not be used.

8.3. Reconciliation with User Requirements

A data quality assessment will be conducted by the project Quality Assessment Leader to identify cases where the projects MQOs were not met.

9.0 REFERENCES

GeoEngineers, Inc. (2015a). Engineering Design Report, Aladdin Plating Site, 1657 Center Street, Tacoma, Washington. GEI File No 0504-095-00. August 26, 2015.

GeoEngineers, Inc. (2015b). Compliance Monitoring Plan, Aladdin Plating Site, 1657 Center Street, Tacoma, Washington. GEI File No 0504-095-00. August 26, 2015.

GeoEngineers, Inc. (2014a). Final Remedial Investigation/Feasibility Study, Former Aladdin Plating Site, 1657 Center Street, Tacoma, Washington. GEI File No 0504-095-00, dated December 10, 2014.

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TABLES

Table 1

Measurement Quality Objectives

Aladdin Plating Site Remediation Project

Tacoma, Washington

Laboratory Analysis	Reference Method	QC Check Standards (Laboratory Control Samples & Matrix Spike Samples) Soil %R[1]	RPD% Both Soil/Water	Surrogate Standards (SS) %R Limits[1] Soil (Water)	Field Duplicate Samples RPD Limits[2] Soil	Water
Total Metals	6010 - ICP-OES, 200.8 ICPMS 7470/7471 CVA	75-125	20	NA	≤50%	≤35%
TCLP Metals	6010 - ICP-OES/7470-CVA	75-125	20	NA	≤50%	≤35%
Gasoline-range petroleum hydrocarbons	NW-TPHGx	74-125	50	62-134 (79-120)	≤50%	≤35%
Diesel- and oil-range petroleum hydrocarbons	NW-TPHDx	61-119	50	50-150	≤50%	≤35%
WAD Cyanide	SM4500 CN I	75-125	20	NA	≤50%	≤35%
Volatile Organic Compounds	SW8260B	Current Laboratory Control Limits	30	1,2-Dichloroethane-d4 : (80-149) 1,2-Dichlorobenzene-d4: (80-120) Toluene-d8: (77-120) 4-Bromofluorobenzene: (80-120) Dibromofluoromethane: (80-120)	≤50%	≤35%
Semi-Volatile Organic Compounds	SW8270D	Current Laboratory Control Limits	30	2-Fluorophenol: (22-120) Phenol-d5: (27-120) 2-Chlorophenol-d4: (36-120) 1,2-Dichlorobenzene-d4: (38-120) Nitrobenzene-d5: (32-120) 2-Fluorobiphenyl: (39-120) 2,4,6-Tribromophenol: (31-131) p-Terphenyl-d14: (31-130)	≤50%	≤35%
Polychlorinated Biphenyls (PCBs)	SW8082B	Aroclor 1016: (52-120) Aroclor 1260: (57-120)	30	Decachlorobiphenyl: (40-133) Tetrachlorometaxylene: (53-120)	≤50%	≤35%
Pesticides	SW8081A	Current Laboratory Control Limits	30	Decachlorobiphenyl: (34-145) Tetrachlorometaxylene: (23-135)	≤50%	≤35%

Notes:

[1] Percent recovery limits are compound-specific and based on laboratory studies. The surrogate %R and laboratory control/matrix spike sample %R control limits presented are the ranges for all of the individual analytes in the identified analysis. The individual control limits will be provided with the laboratory report for each analysis.

[2] RPD control limits are only applicable if the concentrations are greater than 5 times the method reporting limit (MRL). For results less than 5 times the MRL, the difference between the sample and duplicate must be less than 2 times the MRL for soils and 1 times the MRL for waters.

%R = Percent recovery

NA = Not Applicable

RPD = Relative Percent Difference

Table 2

Methods of Analysis and Target Reporting Limits for Backfill Confirmation Soil Samples

Aladdin Plating Site Remediation Project

Tacoma, Washington

Analyte	Analytical Method	Target Report Limit[1]	Laboratory Reporting Limit
Total Metals (mg/kg)			
Antimony	6010 - ICP-OES	NE	5.0
Arsenic	6010 - ICP-OES	20[2]	5.0
Beryllium	6010 - ICP-OES	NE	0.1
Cadmium	6010 - ICP-OES	2[2]	0.2
Chromium	6010 - ICP-OES	2,000 [2]	0.5
Hexavalent Chromium	EPA 3500-Cr B	19 [2]	0.1
Copper	6010 - ICP-OES	NE	0.2
Lead	6010 - ICP-OES	250[2]	2.0
Mercury	7471A-CVAA	2[2]	0.5
Nickel	6010 - ICP-OES	1,600	1.0
Selenium	6010 - ICP-OES	400	5.0
Silver	6010 - ICP-OES	400	0.3
Thallium	6010 - ICP-OES	NE	5.0
Zinc	6010 - ICP-OES	NE	1.0
Petroleum Hydrocarbons (mg/kg)			
Gasoline-range petroleum hydrocarbons	NW--TPH-G	30/100[2,3]	5
Diesel- and oil-range petroleum hydrocarbons	NW-TPHDx	2000[2]	10/25
Volatile Organic Compounds (µg/kg)			
1,1,1,2-Tetrachloroethane	SW8260	38,000	1.0
1,1,1-Trichloroethane	SW8260	2,000[2]	1.0
1,1,2,2-Tetrachloroethane	SW8260	5,000	1.0
1,1,2-Trichloroethane	SW8260	18,000	1.0
1,1-Dichloroethane	SW8260	NE	1.0
1,1-Dichloroethene	SW8260	NE	1.0
1,1-Dichloropropene	SW8260	NE	1.0
1,2,3-Trichlorobenzene	SW8260	NE	5.0
1,2,3-Trichloropropane	SW8260	140	2.0
1,2,4-Trichlorobenzene	SW8260	NE	5.0
1,2,4-Trimethylbenzene	SW8260	NE	1.0
1,2-Dibromo-3-Chloropropane	SW8260	710	5.0
1,2-Dichlorobenzene	SW8260	NE	1.0
1,2-Dichloroethane	SW8260	11,000	1.0
1,2-Dichloropropane	SW8260	15,000	1.0
1,3,5-Trimethylbenzene	SW8260	NE	1.0
1,3-Dichlorobenzene	SW8260	NE	1.0
1,3-Dichloropropane	SW8260	NE	1.0
1,4-Dichlorobenzene	SW8260	42,000	1.0
2,2-Dichloropropane	SW8260	NE	1.0
2-Chlorotoluene	SW8260	NE	1.0
4-Chlorotoluene	SW8260	NE	1.0
Acrolein	SW8260	NE	50
Acrylonitrile	SW8260	1,900	5.0
Benzene	SW8260	30[2]	1.0
Bromobenzene	SW8260	NE	1.0
Bromochloromethane	SW8260	NE	1.0
Bromoform	SW8260	130,000	1.0
Bromomethane	SW8260	NE	1.0
Carbon Tetrachloride	SW8260	7,700	1.0
Chlorobenzene	SW8260	NE	1.0
Chloroethane	SW8260	350,000	1.0
Chloroform	SW8260	160,000	1.0
Chloromethane	SW8260	77,000	1.0
Cis-1,2-Dichloroethene	SW8260	NE	1.0
Cis-1,3-Dichloropropene	SW8260	NE	1.0
Dibromochloromethane	SW8260	12,000	1.0
Dibromomethane	SW8260	NE	1.0
Dichlorobromomethane	SW8260	16,000	1.0
Dichlorodifluoromethane (CFC-12)	SW8260	NE	1.0
Ethylbenzene	SW8260	6000[2]	1.0
Ethylene dibromide	SW8260	5	1.0
Hexachlorobutadiene	SW8260	13,000	5.0
Isopropylbenzene (Cumene)	SW8260	NE	1.0
Methyl t-butyl ether	SW8260	100	1.0
Methylene Chloride	SW8260	20	2.0
Naphthalene	SW8260	50,002	5.0
n-Butylbenzene	SW8260	NE	1.0
n-Propylbenzene	SW8260	NE	1.0
p-Isopropyltoluene	SW8260	NE	1.0
Sec-Butylbenzene	SW8260	NE	1.0
Styrene	SW8260	33,000	1.0

Analyte	Analytical Method	Target Report Limit[1]	Laboratory Reporting Limit
Tert-Butylbenzene	SW8260	NE	1.0
Tetrachloroethene	SW8260	50	1.0
Toluene	SW8260	7000[2]	1.0
Xylenes	SW8260	9000[2]	1.0
Trans-1,2-Dichloroethene	SW8260	NE	1.0
Trans-1,3-Dichloropropene	SW8260	NE	1.0
Trichloroethene	SW8260	30[2]	1.0
Trichlorofluoromethane (CFC-11)	SW8260	NE	1.0
Vinyl Chloride	SW8260	670	1.0
Semi-volatile Organic Compounds (µg/kg)			
1,2,4-Trichlorobenzene	SW8270	NE	67
1,2-Dichlorobenzene	SW8270	NE	67
1,3-Dichlorobenzene	SW8270	NE	67
1,4-Dichlorobenzene	SW8270	42,000	67
1-Methylnaphthalene	SW8270	NE	67
2,2'-Oxybis[1-chloropropane]	SW8270	14,000	67
2,4,5-Trichlorophenol	SW8270	NE	330
2,4,6-Trichlorophenol	SW8270	91,000	330
2,4-Dichlorophenol	SW8270	NE	330
2,4-Dimethylphenol	SW8270	NE	67
2,4-Dinitrophenol	SW8270	NE	670
2,4-Dinitrotoluene	SW8270	NE	330
2,6-Dinitrotoluene	SW8270	NE	330
2-Chloronaphthalene	SW8270	NE	67
2-Chlorophenol	SW8270	NE	67
2-Methylnaphthalene	SW8270	NE	67
2-Nitroaniline	SW8270	NE	330
2-Nitrophenol	SW8270	NE	67
3,3'-Dichlorobenzidine	SW8270	2,200	330
3-Nitroaniline	SW8270	NE	330
4,6-Dinitro-2-Methylphenol	SW8270	NE	670
4-Bromophenyl phenyl ether	SW8270	NE	67
4-Chloro-3-Methylphenol	SW8270	NE	330
4-Chloroaniline	SW8270	NE	330
4-Chlorophenyl-Phenylether	SW8270	NE	67
4-Nitroaniline	SW8270	NE	330
4-Nitrophenol (p-Nitrophenol)	SW8270	NE	330
Acenaphthene	SW8270	NE	67
Acenaphthylene	SW8270	NE	67
Anthracene	SW8270	NE	67
Benzo(a)anthracene	SW8270	NE	67
Benzo(a)pyrene	SW8270	140	67
Benzo(b)fluoranthene	SW8270	NE	67
Benzo(ghi)perylene	SW8270	NE	67
Benzo(k)fluoranthene	SW8270	NE	67
Benzoic Acid	SW8270	NE	670
Benzyl Alcohol	SW8270	NE	330
Bis(2-Chloroethoxy)Methane	SW8270	NE	67
Bis(2-Chloroethyl)Ether	SW8270	910	67
Bis(2-Ethylhexyl) Phthalate	SW8270	71,000	67
Butyl benzyl phthalate	SW8270	NE	67
Carbazole	SW8270	50,000	67
Chrysene	SW8270	NE	67
Dibenzo(a,h)anthracene	SW8270	NE	67
Dibenzofuran	SW8270	NE	67
Dibutyl phthalate	SW8270	NE	67
Diethyl phthalate	SW8270	NE	67
Dimethyl phthalate	SW8270	NE	67
Di-N-Octyl Phthalate	SW8270	NE	67
Fluoranthene	SW8270	NE	67
Fluorene	SW8270	NE	67
Hexachlorobenzene	SW8270	630	67
Hexachlorobutadiene	SW8270	13,000	67
Hexachlorocyclopentadiene	SW8270	NE	330
Hexachloroethane	SW8270	71,000	67
Indeno(1,2,3-cd)pyrene	SW8270	NE	67
Isophorone	SW8270	1,100,000	67
Naphthalene	SW8270	5,000	67
Nitrobenzene	SW8270	NE	67
N-Nitrosodi-n-propylamine	SW8270	140	67
N-Nitrosodiphenylamine	SW8270	200,000	67
o-Cresol (2-methylphenol)	SW8270	NE	67
p-Cresol (4-methylphenol)	SW8270	NE	67
Pentachlorophenol	SW8270	8,300	330
Phenanthrene	SW8270	NE	67
Phenol	SW8270	NE	67
Pyrene	SW8270	NE	67

Analyte	Analytical Method	Target Report Limit[1]	Laboratory Reporting Limit
PCB Aroclors (mg/kg)			
PCB-aroclor 1016	SW8082B	NE	0.020
PCB-aroclor 1221	SW8082B	NE	0.020
PCB-aroclor 1232	SW8082B	NE	0.020
PCB-aroclor 1242	SW8082B	NE	0.020
PCB-aroclor 1248	SW8082B	NE	0.020
PCB-aroclor 1254	SW8082B	NE	0.020
PCB-aroclor 1260	SW8082B	NE	0.020
Total PCBs	SW8082B	1	0.020
Pesticides (µg/kg)			
4,4'-DDD	SW8081A	4,200	3.3
4,4'-DDE	SW8081A	2,900	3.3
4,4'-DDT	SW8081A	2,900	3.3
Aldrin	SW8081A	59	1.7
Alpha-BHC	SW8081A	160	1.7
alpha-Chlordane	SW8081A	NE	1.7
Beta-BHC	SW8081A	560	1.7
Delta-BHC	SW8081A	NE	1.7
Dieldrin	SW8081A	63	3.3
Endosulfan I	SW8081A	NE	1.7
Endosulfan II	SW8081A	NE	3.3
Endosulfan Sulfate	SW8081A	NE	3.3
Endrin	SW8081A	NE	3.3
Endrin Aldehyde	SW8081A	NE	3.3
Endrin Ketone	SW8081A	NE	3.3
Heptachlor	SW8081A	220	1.7
Heptachlor Epoxide	SW8081A	110	1.7
Lindane	SW8081A	10	1.7
Methoxychlor	SW8081A	NE	17.0
Toxaphene	SW8081A	910	85.0
trans-Chlordane	SW8081A	NE	1.7

Notes:

[1] Model Toxics Control Act (MTCA) Method B soil cleanup levels as well as Method A cleanup levels where noted (Chapter 173-340 WAC).

[2] MTCA Method A soil cleanup level.

[3] 30 mg/kg if benzene is present; 100 mg/kg if benzene is not present

µg/kg = microgram per kilogram

mg/kg = milligram per kilogram

NE = not established

PCB = polychlorinated biphenyls

Table 3

Methods of Analysis and Target Reporting Limits for Limits of Soil Excavation Verification Soil Samples

Aladdin Plating Site Remediation Project

Tacoma, Washington

Analyte	Analytical Method	Target Reporting Limit[1]	Laboratory Reporting Limit
Total Metals (mg/kg)			
Chromium	6010 - ICP-OES	2,000	0.5
Lead	6010 - ICP-OES	250	2.0
Nickel	6010 - ICP-OES	160	1.0
TCLP Metals (mg/L)			
Chromium	TCLP-6010	5	0.02
Lead	TCLP-6010	5	0.1
Nickel	TCLP-6010	5	0.05

Notes:

[1] Model Toxics Control Act Method B soil cleanup levels (Chapter 173-340 WAC) for total metals and Toxicity Characteristic criteria (Chapter 173-303 WAC) for TCLP metals.

TCLP = Toxicity Characteristic Leaching Procedure

mg/kg = Milligram per kilogram

mg/L = Milligram per liter

Table 4

Methods of Analysis and Target Reporting Limits for Stockpile Characterization for Disposal Soil Samples

Aladdin Plating Site Remediation Project

Tacoma, Washington

Analyte	Analytical Method	Target Reporting Limit[1]	Laboratory Reporting Limit
Total Metals (mg/kg)			
Arsenic	6010 - ICP-OES	100	5.0
Barium	6010 - ICP-OES	2,000	0.3
Cadmium	6010 - ICP-OES	20	0.2
Chromium	6010 - ICP-OES	100	0.5
Hexavalent Chromium	6010 - ICP-OES	19	0.1
Lead	6010 - ICP-OES	100	2
Mercury	7471-CVA	2	0.025
Selenium	6010 - ICP-OES	20	5
Silver	6010 - ICP-OES	100	0.3
TCLP Metals (mg/L)			
Arsenic	6010 - ICP-OES	5	0.25
Barium	6010 - ICP-OES	100	0.015
Cadmium	6010 - ICP-OES	1	0.01
Chromium	6010 - ICP-OES	5	0.025
Lead	6010 - ICP-OES	5	0.1
Mercury	7471-CVA	0.2	0.0005
Selenium	6010 - ICP-OES	1	0.25
Silver	6010 - ICP-OES	5	0.015
Petroleum Hydrocarbons (mg/kg)			
Gasoline-range Petroleum Hydrocarbons	NWTPH-G	30/100	5.0
Diesel- and Oil-range Petroleum Hydrocarbons	NWTPH-Dx	2000	5.0
Volatile Organic Compounds (µg/kg)			
1,1,1,2-Tetrachloroethane	SW8260B	38,000	1.0
1,1,1-Trichloroethane	SW8260B	2,000	1.0
1,1,2,2-Tetrachloroethane	SW8260B	5,000	1.0
1,1,2-Trichloroethane	SW8260B	18,000	1.0
1,1-Dichloroethane	SW8260B	NE	1.0
1,1-Dichloroethene	SW8260B	NE	1.0
1,1-Dichloropropene	SW8260B	NE	1.0
1,2,3-Trichlorobenzene	SW8260B	NE	5.0
1,2,3-Trichloropropane	SW8260B	140	2.0
1,2,4-Trichlorobenzene	SW8260B	NE	5.0
1,2,4-Trimethylbenzene	SW8260B	NE	1.0
1,2-Dibromo-3-Chloropropane	SW8260B	710	5.0
1,2-Dichlorobenzene	SW8260B	NE	1.0
1,2-Dichloroethane	SW8260B	11,000	1.0
1,2-Dichloropropane	SW8260B	15,000	1.0
1,3,5-Trimethylbenzene	SW8260B	NE	1.0
1,3-Dichlorobenzene	SW8260B	NE	1.0
1,3-Dichloropropane	SW8260B	NE	1.0
1,4-Dichlorobenzene	SW8260B	42,000	1.0
2,2-Dichloropropane	SW8260B	NE	1.0
2-Chlorotoluene	SW8260B	NE	1.0
4-Chlorotoluene	SW8260B	NE	1.0
Acrolein	SW8260B	NE	1.0
Acrylonitrile	SW8260B	1,900	5.0
Benzene	SW8260B	30	1.0
Bromobenzene	SW8260B	NE	1.0
Bromochloromethane	SW8260B	NE	1.0
Bromoform	SW8260B	130,000	1.0
Bromomethane	SW8260B	NE	1.0
Carbon Tetrachloride	SW8260B	7,700	1.0
Chlorobenzene	SW8260B	NE	1.0
Chloroethane	SW8260B	350,000	1.0
Chloroform	SW8260B	160,000	1.0
Chloromethane	SW8260B	77,000	1.0
Cis-1,2-Dichloroethene	SW8260B	NE	1.0
Cis-1,3-Dichloropropene	SW8260B	NE	1.0
Dibromochloromethane	SW8260B	12,000	1.0
Dibromomethane	SW8260B	NE	1.0
Dichlorobromomethane	SW8260B	16,000	1.0
Dichlorodifluoromethane (CFC-12)	SW8260B	NE	1.0
Ethylbenzene	SW8260B	6,000	1.0

Analyte	Analytical Method	Target Reporting Limit[1]	Laboratory Reporting Limit
Ethylene dibromide	SW8260B	5	1.0
Hexachlorobutadiene	SW8260B	13,000	5.0
Isopropylbenzene (Cumene)	SW8260B	NE	1.0
Methyl t-butyl ether	SW8260B	100	1.0
Methylene Chloride	SW8260B	20	2.0
Naphthalene	SW8260B	5,000	5.0
n-Butylbenzene	SW8260B	NE	1.0
n-Propylbenzene	SW8260B	NE	1.0
p-Isopropyltoluene	SW8260B	NE	1.0
Sec-Butylbenzene	SW8260B	NE	1.0
Styrene	SW8260B	33,000	1.0
Tert-Butylbenzene	SW8260B	NE	1.0
Tetrachloroethene	SW8260B	50	1.0
Toluene	SW8260B	7,000	1.0
Xylenes	SW8260B	9,000	1.0
Trans-1,2-Dichloroethene	SW8260B	NE	1.0
Trans-1,3-Dichloropropene	SW8260B	NE	1.0
Trichloroethene	SW8260B	30	1.0
Trichlorofluoromethane (CFC-11)	SW8260B	NE	1.0
Vinyl Chloride	SW8260B	670	1.0

Notes:

[1] Criteria presented include concentrations equivalent to 20 times the Toxicity Characteristic criteria (i.e., 20 time rule values) for total metals, the Toxicity Characteristic criteria for TCLP metals, and Model Toxics Control Act Method B and Method A soil cleanup levels for petroleum hydrocarbons and volatile organic compounds.

μg/kg = microgram per kilogram

mg/kg = milligram per kilogram

mg/L = milligram per liter

NE = not established

Table 5

Methods of Analysis and Target Reporting Limits for Groundwater Compliance Monitoring Samples

Aladdin Plating Site Remediation Project

Tacoma, Washington

Analyte	Analytical Method	Target Reporting Limit[1]	Laboratory Reporting Limit
Dissolved Metals (µg/L)			
Chromium	200.8 - ICPMS	50	0.5
Hexavalent Chromium	SM 3500-Cr D	50	10
Lead	200.8 - ICPMS	50	0.1
Nickel	200.8 - ICPMS	320	0.5

Notes:

[1] Model Toxics Cleanup Act (MTCA) Method A or B Cleanup Level for groundwater.

µg/L = Microgram per liter

Table 6

Test Methods, Sample Containers, Preservation and Holding Times

Aladdin Plating Site Remediation Project
Tacoma, Washington

Analysis	Soil					Water				
	Method	Minimum Sample Size	Sample Containers	Sample Preservation	Holding Times	Method	Minimum Sample Size	Sample Containers	Sample Preservation	Holding Times
Total/Dissolved Metals	EPA 6010-OES 7471A	50 g	8 oz glass wide-mouth with Teflon-lined lid	Cool ≤6°C	6 months	EPA 6010-OES 7470A	200 mL	500 mL HDPE	Cool ≤6°C pH<2 with 1:1 HNO3	6 months
TCLP Metals	EPA 6010-OES 7470A	50 g	8 oz glass wide-mouth with Teflon-lined lid	Cool ≤6°C	6 months	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Total and WAD Cyanide	SM 4500-CN 1	25 g	4 oz glass wide-mouth with Teflon-lined lid	Cool ≤6°C	14 days	SM 4500-CN 1	200 mL	500 mL HDPE	Cool ≤6°C pH >12 with NaOH if sulfides not present	14 days if preserved, 48 hours if not
Volatile Organic Compounds	EPA 8260 PT-GC/MS	5 g	Three 40 mL glass vials with septa, 2 oz glass wide-mouth with septa	Cool ≤6°C two vials Na2S2O4, one MeOH	14 days	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Semi-Volatile Organic Compounds	EPA 8207D	50 g	8 oz glass wide-mouth with Teflon-lined lid	Cool ≤6°C	14 days to extract 40 days to analysis	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Gasoline-Range Petroleum Hydrocarbons	NWTPH-G	25 g	Two 40 mL glass vials with septa, 2 oz glass wide-mouth with septa	Cool ≤6°C MeOH	14 days	NWTPH-G	40 mL	Three 40-ml VOC vials	Cool ≤6°C HCl to pH <2	14 days
Diesel- and Oil-Range Petroleum Hydrocarbons	NWTPH-Dx	25 g	8 oz glass wide-mouth with Teflon-lined lid	Cool ≤6°C	14 days to extract 40 days to analysis	NWTPH-Dx	500 mL	Two 500-mL amber glass	Cool ≤6°C	7 days to extract 40 days to analysis
PCBs	EPA 8082B	25 g	8 oz glass wide-mouth with Teflon-lined lid	Cool ≤6°C	14 days to extract 40 days to analysis	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Pesticides	EPA 8081A	25 g	8 oz glass wide-mouth with Teflon-lined lid	Cool ≤6°C	14 days to extract 40 days to analysis	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Notes:

Holding Times are based on elapsed time from date of collection.
EPA = Environmental Protection Agency
g = gram
HNO3 = Nitric Acid
MeOH = Methanol
mL = milliliter
Na2S2O4 = Sodium bisulfate
NaOH = Sodium Hydroxide
oz = ounce
PCBs = Polychlorinated biphenyls
TCLP = Toxicity Characteristic Leaching Procedure
WAD = weak acid dissociable

Table 7

Quality Control Samples - Type and Frequency

Aladdin Plating Site Remediation Project

Tacoma, Washington

Chemical Analysis	Field QC		Laboratory QC				
	Field Duplicates	Trip Blanks	Method Blanks	LCS	Matrix Spike	Matrix Spike Duplicate	Duplicate
Soil							
Total Metals	1 per every 10 samples	NA	One per batch	One per batch	One per batch	NA	One per batch
TCLP Metals	1 per every 10 samples	NA	One per batch	NA	One per batch	NA	NA
Total and WAD Cyanide	1 per every 10 samples	NA	One per batch	One per batch	One per batch	NA	One per batch
Volatile Organic Compounds	1 per every 10 samples	One per cooler containing VOC samples	One per batch	One per batch	One per batch	One per batch	NA
Semi-Volatile Organic Compounds	1 per every 10 samples	NA	One per batch	One per batch	One per batch	One per batch	NA
Gasoline-Range Petroleum Hydrocarbons	1 per every 10 samples	NA	One per batch	One per batch	One per batch	One per batch	NA
Diesel- and Oil-Range Petroleum Hydrocarbons	1 per every 10 samples	NA	One per batch	One per batch	One per batch	One per batch	NA
PCBs	1 per every 10 samples	NA	One per batch	One per batch	One per batch	One per batch	NA
Pesticides	1 per every 10 samples	NA	One per batch	One per batch	One per batch	One per batch	NA
Water							
Total and Dissolved Metals	1 per groundwater compliance monitoring sampling event	NA	One per batch	One per batch	One per batch	NA	One per batch
Hexavalent Chromium	1 per groundwater compliance monitoring sampling event	NA	One per batch	One per batch	One per batch	NA	One per batch
Total, Free, and WAD Cyanide	1 per groundwater compliance monitoring sampling event	NA	One per batch	One per batch	One per batch	NA	One per batch
Gasoline-Range Petroleum Hydrocarbons	1 per groundwater compliance monitoring sampling event	NA	One per batch	One per batch	One per batch	One per batch	NA
Diesel- and Oil-Range Petroleum Hydrocarbons	1 per groundwater compliance monitoring sampling event	NA	One per batch	One per batch	One per batch	One per batch	NA

Notes:

An analytical batch is defined as a group of samples taken through a preparation procedure and sharing a method blank, LCS, and MS/MSD (or MS and lab duplicate).

No more than 20 field samples can be contained in one batch.

LCS = Laboratory control sample

MS = Matrix spike sample

MSD = Matrix spike duplicate sample

NA = Not Applicable

QC = Quality control

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ATTACHMENT 2
Figures Summarizing Contaminant Concentrations in Soil

Office: PDX Path: \\pdx\projects\0\0504095_GIS\GIS\00\MXD\050409500_F12_Extent_of_Hex_Chromium.mxd Map Revised: 19 September 2014 maugust

Data Source: Aerial image base from Google Earth Pro
Historical site features from Landau Associates, Historical Electroplating Operations, Figure 3, November 7, 2005.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Extent of Hexavalent Chromium Contamination in Site Soil

Former Aladdin Plating Facility
Tacoma, Washington

GeoEngineers

Figure 12

MW-1s Groundwater Monitoring Well Location and Number

SB-3 Boring Location and Number

Property Boundary

Historical Site Features

Soil with lead concentrations above the MTCA Method A cleanup level of 250 mg/kg.

N W E S

15 0 15

Feet

Data Source: Aerial image base from Google Earth Pro
Historical site features from Landau Associates, Historical Electroplating Operations, Figure 3, November 7, 2005.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

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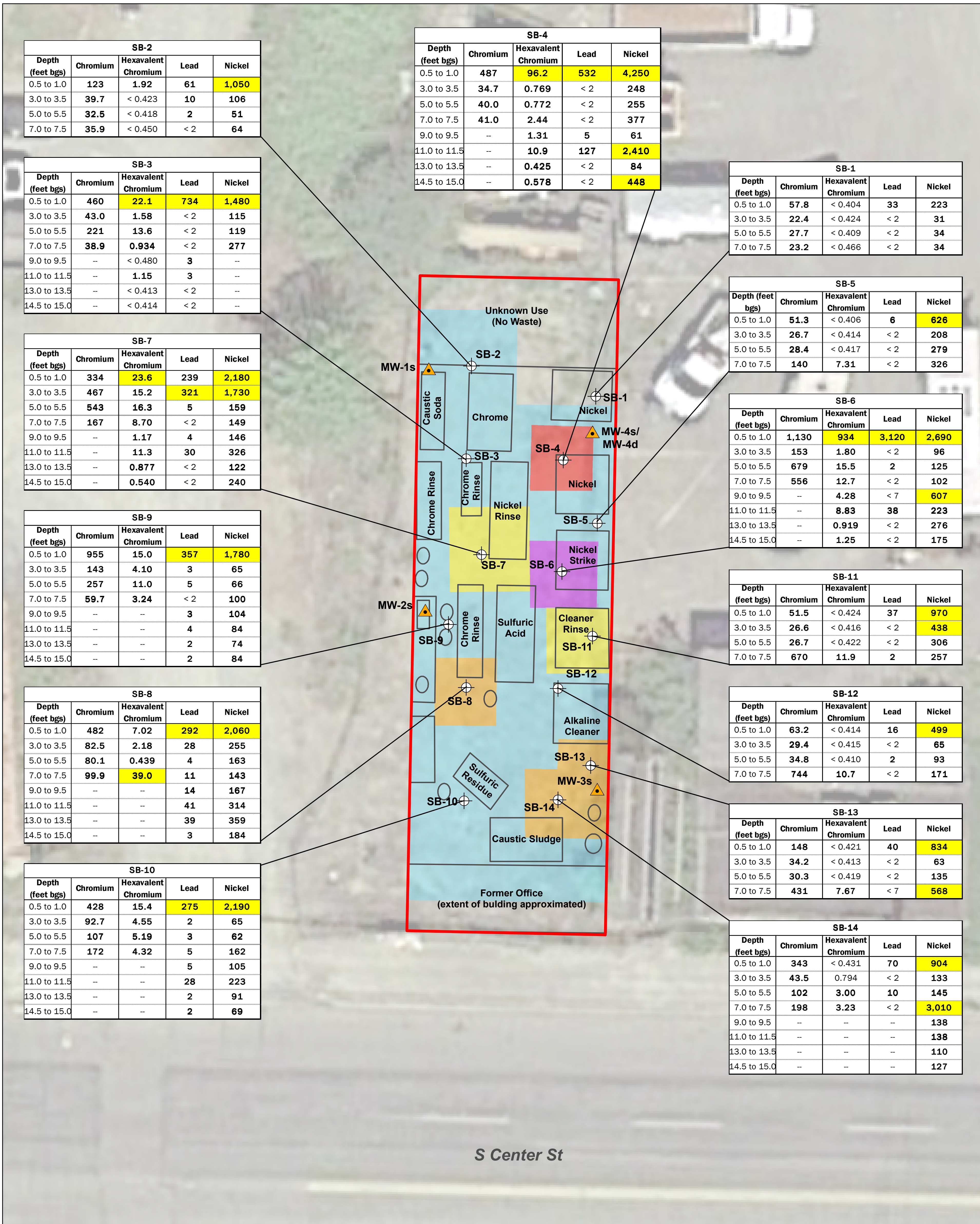
Extent of Lead Contamination in Site Soil

Former Aladdin Plating Facility
Tacoma, Washington

GEOENGINEERS

Figure 13



SB-2				
Depth (feet bgs)	Chromium	Hexavalent Chromium	Lead	Nickel
0.5 to 1.0	123	1.92	61	1,050
3.0 to 3.5	39.7	< 0.423	10	106
5.0 to 5.5	32.5	< 0.418	2	51
7.0 to 7.5	35.9	< 0.450	< 2	64

SB-3				
Depth (feet bgs)	Chromium	Hexavalent Chromium	Lead	Nickel
0.5 to 1.0	460	22.1	734	1,480
3.0 to 3.5	43.0	1.58	< 2	115
5.0 to 5.5	221	13.6	< 2	119
7.0 to 7.5	38.9	0.934	< 2	277
9.0 to 9.5	--	< 0.480	3	--
11.0 to 11.5	--	1.15	3	--
13.0 to 13.5	--	< 0.413	< 2	--
14.5 to 15.0	--	< 0.414	< 2	--

SB-7				
Depth (feet bgs)	Chromium	Hexavalent Chromium	Lead	Nickel
0.5 to 1.0	334	23.6	239	2,180
3.0 to 3.5	467	15.2	321	1,730
5.0 to 5.5	543	16.3	5	159
7.0 to 7.5	167	8.70	< 2	149
9.0 to 9.5	--	1.17	4	146
11.0 to 11.5	--	11.3	30	326
13.0 to 13.5	--	0.877	< 2	122
14.5 to 15.0	--	0.540	< 2	240

SB-9				
Depth (feet bgs)	Chromium	Hexavalent Chromium	Lead	Nickel
0.5 to 1.0	955	15.0	357	1,780
3.0 to 3.5	143	4.10	3	65
5.0 to 5.5	257	11.0	5	66
7.0 to 7.5	59.7	3.24	< 2	100
9.0 to 9.5	--	--	3	104
11.0 to 11.5	--	--	4	84
13.0 to 13.5	--	--	2	74
14.5 to 15.0	--	--	2	84

SB-8				
Depth (feet bgs)	Chromium	Hexavalent Chromium	Lead	Nickel
0.5 to 1.0	482	7.02	292	2,060
3.0 to 3.5	82.5	2.18	28	255
5.0 to 5.5	80.1	0.439	4	163
7.0 to 7.5	99.9	39.0	11	143
9.0 to 9.5	--	--	14	167
11.0 to 11.5	--	--	41	314
13.0 to 13.5	--	--	39	359
14.5 to 15.0	--	--	3	184

SB-10				
Depth (feet bgs)	Chromium	Hexavalent Chromium	Lead	Nickel
0.5 to 1.0	428	15.4	275	2,190
3.0 to 3.5	92.7	4.55	2	65
5.0 to 5.5	107	5.19	3	62
7.0 to 7.5	172	4.32	5	162
9.0 to 9.5	--	--	5	105
11.0 to 11.5	--	--	28	223
13.0 to 13.5	--	--	2	91
14.5 to 15.0	--	--	2	69

SB-4				
Depth (feet bgs)	Chromium	Hexavalent Chromium	Lead	Nickel
0.5 to 1.0	487	96.2	532	4,250
3.0 to 3.5	34.7	0.769	< 2	248
5.0 to 5.5	40.0	0.772	< 2	255
7.0 to 7.5	41.0	2.44	< 2	377
9.0 to 9.5	--	1.31	5	61
11.0 to 11.5	--	10.9	127	2,410
13.0 to 13.5	--	0.425	< 2	84
14.5 to 15.0	--	0.578	< 2	448

SB-1				
Depth (feet bgs)	Chromium	Hexavalent Chromium	Lead	Nickel
0.5 to 1.0	57.8	< 0.404	33	223
3.0 to 3.5	22.4	< 0.424	< 2	31
5.0 to 5.5	27.7	< 0.409	< 2	34
7.0 to 7.5	23.2	< 0.466	< 2	34

SB-5				
Depth (feet bgs)	Chromium	Hexavalent Chromium	Lead	Nickel
0.5 to 1.0	51.3	< 0.406	6	626
3.0 to 3.5	26.7	< 0.414	< 2	208
5.0 to 5.5	28.4	< 0.417	< 2	279
7.0 to 7.5	140	7.31	< 2	326

SB-6				
Depth (feet bgs)	Chromium	Hexavalent Chromium	Lead	Nickel
0.5 to 1.0	1,130	934	3,120	2,690
3.0 to 3.5	153	1.80	< 2	96
5.0 to 5.5	679	15.5	2	125
7.0 to 7.5	556	12.7	< 2	102
9.0 to 9.5	--	4.28	< 7	607
11.0 to 11.5	--	8.83	38	223
13.0 to 13.5	--	0.919	< 2	276
14.5 to 15.0	--	1.25	< 2	175

SB-11				
Depth (feet bgs)	Chromium	Hexavalent Chromium	Lead	Nickel
0.5 to 1.0	51.5	< 0.424	37	970
3.0 to 3.5	26.6	< 0.416	< 2	438
5.0 to 5.5	26.7	< 0.422	< 2	306
7.0 to 7.5	670	11.9	2	257

SB-12				
Depth (feet bgs)	Chromium	Hexavalent Chromium	Lead	Nickel
0.5 to 1.0	63.2	< 0.414	16	499
3.0 to 3.5	29.4	< 0.415	< 2	65
5.0 to 5.5	34.8	< 0.410	2	93
7.0 to 7.5	744	10.7	< 2	171

SB-13				
Depth (feet bgs)	Chromium	Hexavalent Chromium	Lead	Nickel
0.5 to 1.0	148	< 0.421	40	834
3.0 to 3.5	34.2	< 0.413	< 2	63
5.0 to 5.5	30.3	< 0.419	< 2	135
7.0 to 7.5	431	7.67	< 7	568

SB-14				
Depth (feet bgs)	Chromium	Hexavalent Chromium	Lead	Nickel
0.5 to 1.0	343	< 0.431	70	904
3.0 to 3.5	43.5	0.794	< 2	133
5.0 to 5.5	102	3.00	10	145
7.0 to 7.5	198	3.23	< 2	3,010
9.0 to 9.5	--	--	--	138
11.0 to 11.5	--	--	--	138
13.0 to 13.5	--	--	--	110
14.5 to 15.0	--	--	--	127

MW-1s Groundwater Monitoring Well Location and Number

SB-3 Boring Location and Number

Property Boundary

Historical Site Features

Proposed Excavation Depths

- Excavate to 2.5 ft bgs
- Excavate to 5.0 ft bgs
- Excavate to 9.0 ft bgs
- Excavate to 11.0 ft bgs
- Excavate to 16.0 ft bgs

Soil Cleanup Levels Using MTCA Method B Values Protective of Groundwater as Drinking Water (mg/kg)

Total Chromium	2,000[1]
Chromium VI	18.4
Lead	250
Nickel	417

[1]Cleanup Level for Chromium III

N W E S

15 0 15
Feet

Results reported in milligrams per kilograms (mg/kg).
Bold results indicate detection of analyte.
Shaded results indicate exceedances of MTCA cleanup levels.

Data Source: Aerial image base from Google Earth Pro
Historical site features from Landau Associates, Historical Electroplating Operations, Figure 3, November 7, 2005.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Notes:
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Remedial Alternative 1 - Soil Excavation to Cleanup Levels Using MTCA Method B Values Protective of Drinking Water

Former Aladdin Plating Facility
Tacoma, Washington

GeoEngineers

Figure 15

ATTACHMENT 3
Groundwater Monitoring Results

Table 1

Summary of Groundwater Chemical Analytical Data (Total Metals)

Aladdin Plating Site Remediation Project
Tacoma, Washington

	Exploration Location[1]	Proposed Groundwater Cleanup Levels[2]	MW-1s					MW-2s				
		Date Sampled	Jun-05	Jul-06	Oct-06	Mar-07	Mar-14	Nov-05	Jul-06	Oct-06	Mar-17	Mar-14
		Sampling Performed by	Landau Associates	Landau Associates	Landau Associates	Landau Associates	GeoEngineers	Landau Associates	Landau Associates	Landau Associates	Landau Associates	GeoEngineers
Total Metals[3] (µg/L)	Beryllium	32.0 [4]	--	<0.10	<0.10	<0.10	--	<0.1	**0.15**	<0.1	**0.19**	--
	Chromium	50 [4]	--	**5.61**	**4.8**	**3.3**	<5	**29.3**	**25.4**	**9.8**	**62.8**	<5
	Nickel	320	--	**6.59**	**6.34**	**3.91**	<0.01	**5.74**	**11.1**	**9.43**	**12.3**	<0.01
	Copper	320	--	**1.74**	**1.17**	**1.34**	--	**0.32**	**3.23**	**2.44**	**5.54**	--
	Zinc	4,800	--	**5.8**	<5.0	**6.1**	--	<5.0	**7.1**	**7.3**	**13**	--
	Arsenic	5 [4]	--	**0.67**	**0.36**	**0.44**	--	**0.26**	**1.01**	**0.69**	**1.58**	--
	Selenium	80	--	<0.5	<1	<0.5	--	<0.50	<0.5	<1.0	<0.5	--
	Silver	80	--	<0.10	<0.10	<0.10	--	<0.10	<0.10	<0.10	<0.10	--
	Antimony	6.4	--	<0.20	<0.20	<0.20	--	<0.20	<0.20	<0.2	<0.2	--
	Cadmium	5 [4]	--	<0.10	<0.14	<0.10	--	<0.10	<0.10	<0.1	<0.1	--
	Thallium	0.160 [4]	--	<0.10	<0.10	<0.10	--	<0.10	<0.10	<0.1	<0.1	--
	Lead	15.0 [4]	--	**0.72**	**0.29**	**0.54**	--	<0.10	**1.02**	**0.66**	**2.68**	--
	Mercury	2	--	<0.050	<0.050	<0.050	--	<0.050	<0.05	**0.05**	**0.05**	--
	Hexavalent Chromium	48 [4]	**2,580**	<11	<11	<11	< 10	**28**	**12**	**26**	**13**	< 10

	Exploration Location[1]	Proposed Groundwater Cleanup Levels[2]	MW-3s					MW-4d					MW-4s					MW-5s			
		Date Sampled	Nov-05	Jul-06	Oct-06	Mar-07	Mar-14	Nov-05	Jul-06	Oct-06	Mar-07	Mar-14	Nov-05	Jul-06	Oct-06	Mar-07	Mar-14	Jul-06	Oct-06	Mar-07	Mar-14
		Sampling Performed by	Landau Associates	Landau Associates	Landau Associates	Landau Associates	GeoEngineers	Landau Associates	Landau Associates	Landau Associates	Landau Associates	GeoEngineers	Landau Associates	Landau Associates	Landau Associates	GeoEngineers	Landau Associates	Landau Associates	Landau Associates	GeoEngineers	Landau Associates
Total Metals[3] (µg/L)	Beryllium	32.0 [4]	<0.1	0.63	<0.10	0.61	–	<0.10	0.2	<0.10	<0.10	–	<0.10	3.41	0.69	4	–	0.13	<0.10	<0.10	–
	Chromium	50 [4]	13.6	49.6	27.1	100	< 5	<0.50	49.1	18.4	4.9	< 5	4.5	286	174	920	98	9.27	11.4	6.27	<5
	Nickel	320	348	1,710	343	2,270	270	1.86	36.6	14.6	8.58	10	11	17,200	17,300	42,400	7,770	14.3	18.7	8.96	<10
	Copper	320	8.34	27.7	6.76	35.7	–	0.84	10.6	2.55	3.01	–	0.44	2.73	0.57	1.87	–	5.69	5.22	2.25	–
	Zinc	4,800	6.6	35	7.2	31	–	10	25	7.1	7.3	–	<5.0	7.3	<5.0	16	–	10	10	59.9	–
	Arsenic	5 [4]	1.2	1.76	0.83	0.79	–	1.62	3.7	0.98	1.15	–	0.45	0.75	0.1	0.13	–	2	1.81	1.05	–
	Selenium	80	<0.50	<0.5	<1.0	<0.50	–	<0.50	0.64	<1.0	<0.50	–	<0.50	<0.5	<1.0	<0.50	<1	<0.5	<1.0	<0.50	–
	Silver	80	<0.10	<0.1	<0.10	<0.10	–	<0.10	<0.1	<0.10	<0.10	–	<0.10	<0.1	<0.10	<0.10	–	<0.1	<0.10	<0.10	–
	Antimony	6.4	0.33	0.36	0.23	<0.20	–	<0.20	<0.2	<0.20	<0.20	–	<0.20	<0.2	<0.20	<0.20	–	<0.2	<0.20	<0.20	–
	Cadmium	5 [4]	<0.10	<0.1	<0.10	0.1	–	<0.10	<0.1	<0.10	<0.10	–	<0.10	<0.1	<0.10	<0.10	–	<0.1	<0.10	<0.10	–
	Thallium	0.160 [4]	<0.10	<0.1	<0.10	<0.10	–	<0.10	<0.1	<0.10	<0.10	–	<0.10	0.1	<0.10	<0.10	–	<0.1	<0.10	<0.10	–
	Lead	15.0 [4]	1.73	3.79	1.22	1.04	–	0.13	2.64	0.52	0.81	–	0.11	0.73	<0.10	0.61	–	1.46	1.22	0.93	–
	Mercury	2	<0.050	<0.05	<0.050	<0.050	–	<0.050	<0.05	<0.050	<0.050	–	<0.050	<0.05	<0.050	<0.050	–	<0.05	<0.050	<0.050	–
	Hexavalent Chromium	48 [4]	<11	15	20	85	< 10	<11	15	<11	<11	< 10	<11	361	199	933	44	12	<11	<11	< 10

	Exploration Location[1]	Proposed Groundwater Cleanup Levels[2]	MW-6s				MW-7s				Direct Push Grab Water Samples [5]									
											SB-15	SB-16	SB-17	SB-18	SB-19	SB-20	SB-21	SB-22	SB-23	SB-24
		Date Sampled	Jul-06	Oct-06	Mar-07	Mar-14	Jul-06	Oct-06	Mar-07	Mar-14	Mar-14	Mar-14	Mar-14	Mar-14	Mar-14	Mar-14	Mar-14	Mar-14	Mar-14	Mar-14
		Sampling Performed by	Landau Associates	Landau Associates	GeoEngineers	GeoEngineers	Landau Associates	Landau Associates	Landau Associates	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers
Total Metals[3] (µg/L)	Beryllium	32.0 [4]	**0.34**	**6**	**0.52**	–	**0.33**	<0.10	<0.10	–	–	–	–	–	–	–	–	–	–	–
	Chromium	50 [4]	**135**	**1,630**	**36**	**10**	**18.4**	**2.5**	**3.4**	<5	**49**	**62**	**17**	**19**	**86**	**42**	< 5	< 5	< 5	< 5
	Nickel	320	**118**	**1,780**	**45.3**	**10**	**18.2**	**4.86**	**4.76**	<10	**1,390**	**3,670**	**260**	**20**	**100**	**70**	< 10	< 10	< 10	< 10
	Copper	320	**31.1**	**642**	**30.9**	–	**10.7**	**1.46**	**1.65**	–	–	–	–	–	–	–	–	–	–	–
	Zinc	4,800	**86.5**	**2000**	**140**	–	**17**	<5.0	**8.7**	–	–	–	–	–	–	–	–	–	–	–
	Arsenic	5 [4]	**10**	**159**	**5.8**	–	**3.12**	**0.69**	**0.77**	–	–	–	–	–	–	–	–	–	–	–
	Selenium	80	**1.7**	<1.0	<5.0	–	**0.5**	<1.0	<0.50	–	–	–	–	–	–	–	–	–	–	–
	Silver	80	**0.14**	**2.1**	<0.10	–	**0.1**	<0.10	<0.1	–	–	–	–	–	–	–	–	–	–	–
	Antimony	6.4	**1.2**	<2.0	**0.25**	–	**0.21**	<0.20	<0.20	–	–	–	–	–	–	–	–	–	–	–
	Cadmium	5 [4]	**0.29**	**2.8**	**0.37**	–	**0.1**	<0.10	<0.10	–	–	–	–	–	–	–	–	–	–	–
	Thallium	0.160 [4]	**0.11**	**2.6**	<0.10	–	**0.1**	<0.10	<0.10	–	–	–	–	–	–	–	–	–	–	–
	Lead	15.0 [4]	**8.57**	**182**	**2.47**	–	**1.99**	**0.33**	**0.28**	–	–	–	–	–	–	–	–	–	–	–
	Mercury	2	<0.05	<0.050	<0.050	–	**0.056**	<0.050	<0.050	–	–	–	–	–	–	–	–	–	–	–
	Hexavalent Chromium	48 [4]	**19**	**47**	<11	< 10	**25**	<11	<11	< 10	**12**	<10	<10	<10	<10	< 10	< 10	< 10	< 10	< 10

Notes:

[1]Exploration locations shown on Figure 6.

[2] MTCA Method A Cleanup Level for groundwater.

[3]Total metals analyzed by U.S. Environmental Protection Agency (EPA) 200.7/6010C

[4]No Method A Value exists for this metal, MTCA Method B Value was used in its place.

[5]Discrete groundwater sample collected from temporary well screen in an open borehole.

µg/L = micrograms per liter

–– = value not calculated; measured from temporary well screen and elevations not surveyed

Bolding indicates analyte was detected. Yellow highlighting indicates exceedance of MTCA cleanup level.

Table 2

Summary of Groundwater Chemical Analytical Data (Dissolved Metals)

Aladdin Plating Site Remediation Project

Tacoma, Washington

Exploration Location[1]	Proposed Groundwater Cleanup Levels[2]	MW-1s					MW-2s					MW-3s				
Date Sampled		**Nov-05**	**Jul-06**	**Oct-06**	**Mar-07**	**Mar-14**	**Nov-05**	**Jul-06**	**Oct-06**	**Mar-07**	**Mar-14**	**Nov-05**	**Jul-06**	**Oct-06**	**Mar-07**	**Mar-14**
Sampling Performed by		**Landau Associates**	**Landau Associates**	**Landau Associates**	**Landau Associates**	**GeoEngineers**	**Landau Associates**	**Landau Associates**	**Landau Associates**	**Landau Associates**	**GeoEngineers**	**Landau Associates**	**Landau Associates**	**Landau Associates**	**Landau Associates**	**GeoEngineers**
Dissolved Metals[3] (µg/L)																
Beryllium	32.0 [4]	–	–	<0.10	<0.10	–	–	–	<0.10	<0.10	–	–	–	<0.1	<0.50	–
Total Chromium	50 [4]	–	–	**4.87**	**2.1**	–	–	–	**4.95**	**44.2**	–	–	–	**22.9**	**78**	–
Nickel	320	–	–	**3.69**	**2.41**	< 10	–	–	**3.07**	**4.15**	< 10	–	–	**314**	**2100**	**250**
Copper	320	–	–	**0.46**	**0.31**	–	–	–	**0.65**	**0.67**	–	–	–	**0.92**	**24.6**	–
Zinc	4,800	–	–	**2.8**	**1.9**	–	–	–	**5.6**	**3**	–	–	–	**6**	**30.4**	–
Arsenic	5 [4]	–	–	**0.38**	**0.31**	–	–	–	**0.47**	**0.33**	–	–	–	**0.66**	**0.46**	–
Selenium	80	–	–	**0.53**	<0.50	–	–	–	<0.50	<0.50	–	–	–	<0.50	0.59	–
Silver	80	–	–	<0.020	<0.020	–	–	–	<0.020	<0.020	–	–	–	<0.020	<0.020	–
Antimony	6.4	–	–	<0.20	<0.20	–	–	–	<0.20	<0.20	–	–	–	<0.20	<0.20	–
Cadmium	5 [4]	–	–	**0.1**	<0.020	–	–	–	**0.037**	<0.020	–	–	–	**0.044**	**0.1**	–
Thallium	0.160 [4]	–	–	<0.1	<0.10	–	–	–	<0.10	<0.10	–	–	–	<0.10	<0.10	–
Lead	15.0 [4]	–	–	**0.057**	**0.06**	–	–	–	**0.048**	**0.05**	–	–	–	**0.05**	**0.049**	–
Mercury	2	–	–	<0.050	<0.050	–	–	–	<0.050	<0.050	–	–	–	<0.050	<0.050	–
Hexavalent Chromium	48 [4]	–	–	<11	<11	–	–	–	<11	**58**	–	–	–	**26**	**106**	–

Exploration Location[1]	Proposed Groundwater Cleanup Levels[2]	MW-4d					MW-4s					MW-5s			
Date Sampled		Nov-05	Jul-06	Oct-06	Mar-07	Mar-14	Nov-05	Jul-06	Oct-06	Mar-07	Mar-14	Jul-06	Oct-06	Mar-07	Mar-14
Sampling Performed by		Landau Associates	Landau Associates	Landau Associates	Landau Associates	GeoEngineers	Landau Associates	Landau Associates	Landau Associates	GeoEngineers	Landau Associates	Landau Associates	Landau Associates	GeoEngineers	Landau Associates
Dissolved Metals[3] (µg/L)															
Beryllium	32.0 [4]	--	--	<0.10	<0.10	--	--	--	**0.18**	**3.31**	--	--	<0.10	<0.10	--
Total Chromium	50 [4]	--	--	**3.21**	**1.9**	--	--	--	**194**	**817**	--	--	**2.1**	**2.3**	--
Nickel	320	--	--	**3.5**	**6.67**	**260**	--	--	**16,300**	**41,900**	**7,690**	--	**7.02**	**5.45**	< 10
Copper	320	--	--	**0.35**	**0.91**	--	--	--	**0.38**	**0.8**	--	--	**0.26**	**0.55**	--
Zinc	4,800	--	--	**1.3**	**5.7**	--	--	--	**5.7**	**8.8**	--	--	**3**	**45.6**	--
Arsenic	5 [4]	--	--	**0.81**	**0.85**	--	--	--	**0.13**	**0.36**	--	--	**0.56**	**0.51**	--
Selenium	80	--	--	**0.74**	**0.87**	--	--	--	<0.50	**0.81**	--	--	<0.50	**0.5**	--
Silver	80	--	--	<0.020	<0.020	--	--	--	<0.020	<0.020	--	--	<0.020	**0.02**	--
Antimony	6.4	--	--	<0.20	<0.20	--	--	--	<0.20	<0.20	--	--	<0.20	**0.2**	--
Cadmium	5 [4]	--	--	**0.02**	**0.023**	--	--	--	**0.064**	**0.291**	--	--	**0.026**	**0.027**	--
Thallium	0.160 [4]	--	--	<0.10	**0.1**	--	--	--	<0.10	<0.10	--	--	<0.10	**0.14**	--
Lead	15.0 [4]	--	--	**0.064**	**0.073**	--	--	--	**0.035**	**0.055**	--	--	**0.027**	**0.095**	--
Mercury	2	--	--	<0.050	**0.05**	--	--	--	<0.050	<0.050	--	--	<0.050	<0.050	--
Hexavalent Chromium	48 [4]	--	--	<11	<11	--	--	--	**193**	**951**	--	--	<11	<11	--

Exploration Location[1]		Proposed Groundwater Cleanup Levels[2]	MW-6s				MW-7s				Direct Push Grab Water Samples [5]									
											SB-15	SB-16	SB-17	SB-18	SB-19	SB-20	SB-21	SB-22	SB-23	SB-24
Date Sampled			Jul-06	Oct-06	Mar-07	Mar-14	Jul-06	Oct-06	Mar-07	Mar-14	Mar-14	Mar-14	Mar-14	Mar-14	Mar-14	Mar-14	Mar-14	Mar-14	Mar-14	Mar-14
Sampling Performed by			Landau Associates	Landau Associates	GeoEngineers															
Dissolved Metals[3] (µg/L)	Beryllium	32.0 [4]	--	<0.10	<0.10	--	--	<0.10	<0.10	--	--	--	--	--	--	--	--	--	--	--
	Total Chromium	50 [4]	--	**2.1**	**1.2**	--	--	**1.1**	**1.4**	--	--	--	--	--	--	--	--	--	--	--
	Nickel	320	--	**19.2**	**11**	< 10	--	**1.93**	**3.08**	--	**1,290**	**3,210**	**230**	<10	<10	**20**	<10	<10	<10	<10
	Copper	320	--	**1.32**	**1.81**	--	--	**0.34**	**0.61**	--	--	--	--	--	--	--	--	--	--	--
	Zinc	4,800	--	**9.2**	**17.5**	--	--	**4.1**	**2.4**	--	--	--	--	--	--	--	--	--	--	--
	Arsenic	5 [4]	--	**0.97**	**1.13**	--	--	**0.56**	**0.58**	--	--	--	--	--	--	--	--	--	--	--
	Selenium	80	--	<0.50	**1.2**	--	--	<0.50	<0.50	--	--	--	--	--	--	--	--	--	--	--
	Silver	80	--	<0.020	<0.020	--	--	<0.020	<0.020	--	--	--	--	--	--	--	--	--	--	--
	Antimony	6.4	--	<0.20	<0.20	--	--	<0.20	<0.20	--	--	--	--	--	--	--	--	--	--	--
	Cadmium	5 [4]	--	**0.076**	**0.074**	--	--	<0.020	<0.020	--	--	--	--	--	--	--	--	--	--	--
	Thallium	0.160 [4]	--	<0.10	<0.10	--	--	<0.10	<0.10	--	--	--	--	--	--	--	--	--	--	--
	Lead	15.0 [4]	--	**0.12**	**0.094**	--	--	**0.049**	**0.13**	--	--	--	--	--	--	--	--	--	--	--
	Mercury	2	--	<0.050	<0.050	--	--	<0.050	<0.050	--	--	--	--	--	--	--	--	--	--	--
	Hexavalent Chromium	48 [4]	--	<11	<11	--	--	<11	**11**	--	--	--	--	--	--	--	--	--	--	--

Notes:

[1]Exploration locations shown on Figure 6.

[2] Model Toxics Cleanup Act (MTCA) Method A Cleanup Level for groundwater.

[3]Dissolved metals analyzed by U.S. Environmental Protection Agency (EPA) 200.7/6010C

[4]No Method A Value exists for this metal, MTCA Method B Value was used in its place.

[5]Discrete groundwater sample collected from temporary well screen in an open borehole.

µg/L = micrograms per liter

-- = value not calculated; measured from temporary well screen and elevations not surveyed

Bolding indicates analyte was detected. Yellow highlighting indicates exceedance of MTCA cleanup level.

Table 3

Summary of Groundwater Level Measurements

Aladdin Plating Site Remediation Project

Tacoma, Washington

Well ID	MW-1s		MW-2s		MW-3s		MW-4s		MW-4d		MW-5s		MW-6s		MW-7s	
Date	Depth to Groundwater (feet)	Groundwater Elevation (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)
Measured by Landau Associates																
11/29/2005	31.79	213.66	31.58	213.77	30.83	213.71	31.38	213.73	33.68	211.56	--	--	--	--	--	--
11/6/2006	31.35	214.10	31.10	214.25	30.43	214.11	31.00	214.11	33.64	211.60	--	--	--	--	--	--
7110/2006	30.09	215.36	30.72	214.63	29.98	214.56	30.56	214.55	32.91	212.33	32.35	215.64	143.00	215.21	28.78	213.91
8/9/2006	31.26	214.19	31.08	214.27	30.34	214.20	30.91	214.20	33.45	211.79	31.70	216.29	143.15	215.06	29.09	213.60
10/19/2006	31.50	213.95	31.33	214.02	30.58	213.96	31.17	213.94	33.45	211.79	32.92	215.07	143.41	214.80	29.31	213.38
11/28/2006	31.01	214.44	30.79	214.56	30.04	214.50	30.71	214.40	33.16	212.0B	32.35	215.64	143.40	214.81	29.12	213.57
12/29/2006	30.84	214.61	30.58	214.77	29.89	214.65	30.49	214.62	32.99	212.25	32.16	215.83	143.29	214.92	28.93	213.76
1/18/2007	30.63	214.82	30.40	214.95	29.70	214.84	30.30	214.81	32.80	212.44	32.00	215.99	142.97	215.24	28.70	213.99
2/26/2007	30.60	214.85	30.41	214.94	29.67	214.87	30.26	214.85	32.52	212.72	31.93	216.06	142.76	215.45	28.57	214.12
3/20/2007	30.41	215.04	30.25	215.1	29.6	214.94	30.1	215.01	32.57	212.67	31.82	216.17	142.66	215.55	28.5	214.19
4/17/2007	30.25	215.20	30.02	215.33	29.34	215.20	29.99	215.12	32.18	213.06	31.63	216.36	142.37	215.84	28.22	214.47
5/31/2007	31.05	214.40	29.95	215.40	29.25	215.29	29.80	215.31	32.15	213.09	31.50	216.49	142.15	216.06	28.05	214.64
6/21/2007	30.13	215.32	29.95	215.4	29.22	215.32	29.80	215.31	32.03	213.21	31.48	216.51	142.13	216.08	28.00	214.69
Measured by GeoEngineers																
1/13/2014	26.03	219.42	25.87	219.48	25.20	219.34	25.70	219.41	28.40	216.84	27.2	220.79	138.1	220.11	24.29	218.4
3/17/2014	25.51	219.94	25.32	220.0	24.62	219.92	25.17	219.94	28.17	217.07	26.65	221.34	137.88	220.33	23.82	218.87

Notes:

'-- = not measured, not tested, or value not established

ATTACHMENT 4
Existing Monitoring Well Logs

Soil Classification System

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS LETTER SYMBOL[1]	TYPICAL DESCRIPTIONS[2][3]
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		GW	Well-graded gravel; gravel/sand mixture(s); little or no fines
				GP	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		GM	Silty gravel; gravel/sand/silt mixture(s)
				GC	Clayey gravel; gravel/sand/clay mixture(s)
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)		SW	Well-graded sand; gravelly sand; little or no fines
				SP	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)		SM	Silty sand; sand/silt mixture(s)
				SC	Clayey sand; sand/clay mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)			ML	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
				CL	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
				OL	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY (Liquid limit greater than 50)			MH	Inorganic silt; micaceous or diatomaceous fine sand
				CH	Inorganic clay of high plasticity; fat clay
				OH	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL			PT	Peat; humus; swamp soil with high organic content

OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		AC or PC	Asphalt concrete pavement or Portland cement pavement
ROCK		RK	Rock (See Rock Classification)
WOOD		WD	Wood, lumber, wood chips
DEBRIS		DB	Construction debris, garbage

Notes:
1. USCS letter symbols correspond to symbols used by the Unified Soil Classification System and ASTM classification methods. Dual letter symbols (e.g., SP-SM for sand or gravel) indicate soil with an estimated 5-15% fines. Multiple letter symbols (e.g., ML/CL) indicate borderline or multiple soil classifications.
2. Soil descriptions are based on the general approach presented in the *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)* outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the *Standard Test Method for Classification of Soils for Engineering Purposes*, as outlined in ASTM D 2487.
3. Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:

Primary Constituent: > 50% - "GRAVEL," "SAND," "SILT," "CLAY," etc.
Secondary Constituents: > 30% and ≤ 50% - "very gravelly," "very sandy," "very silty," etc.
> 15% and ≤ 30% - "gravelly," "sandy," "silty," etc.
Additional Constituents: > 5% and ≤ 15% - "with gravel," "with sand," "with silt," etc.
≤ 5% - "trace gravel," "trace sand," "trace silt," etc., or not noted.

Drilling and Sampling Key

SAMPLER TYPE

Code	Description
a	3.25-inch O.D., 2.42-inch I.D. Split Spoon
b	2.00-inch O.D., 1.50-inch I.D. Split Spoon
c	Shelby Tube
d	Grab Sample
e	Single-Tube Core Barrel
f	Double-Tube Core Barrel
g	Other - See text if applicable
1	300-lb Hammer, 30-inch Drop
2	140-lb Hammer, 30-inch Drop
3	Pushed
4	Rotosonic
5	Air Rotary (Rock)
6	Wash Rotary (Rock)
7	Other - See text if applicable

SAMPLE NUMBER & INTERVAL

Sample Identification Number
Recovery Depth Interval
Sample Depth Interval
Portion of Sample Retained for Archive or Analysis

Field and Lab Test Data

Code	Description
PP = 1.0	Pocket Penetrometer, tsf
TV = 0.5	Torvane, tsf
PID = 100	Photoionization Detector VOC screening, ppm
W = 10	Moisture Content, %
D = 120	Dry Density, pcf
-200 = 60	Material smaller than No. 200 sieve, %
GS	Grain Size - See separate figure for data
AL	Atterberg Limits - See separate figure for data
GT	Other Geotechnical Testing
CA	Chemical Analysis

Groundwater

$\underline{\nabla}$ ATD — Approximate water elevation at time of drilling (ATD) or on date noted. Groundwater levels can fluctuate due to precipitation, seasonal conditions, and other factors.

6/8/07 \\EDMDATA\PROJECTS\934\001\FILERM\ATWELLCO~1\934001.GPJ SOIL CLASS SHEET

LANDAU ASSOCIATES	Former Aladdin Plating Facility Tacoma, Washington	Soil Classification System and Key	Figure A-1

MW1s

SAMPLE DATA / SOIL PROFILE / GROUNDWATER

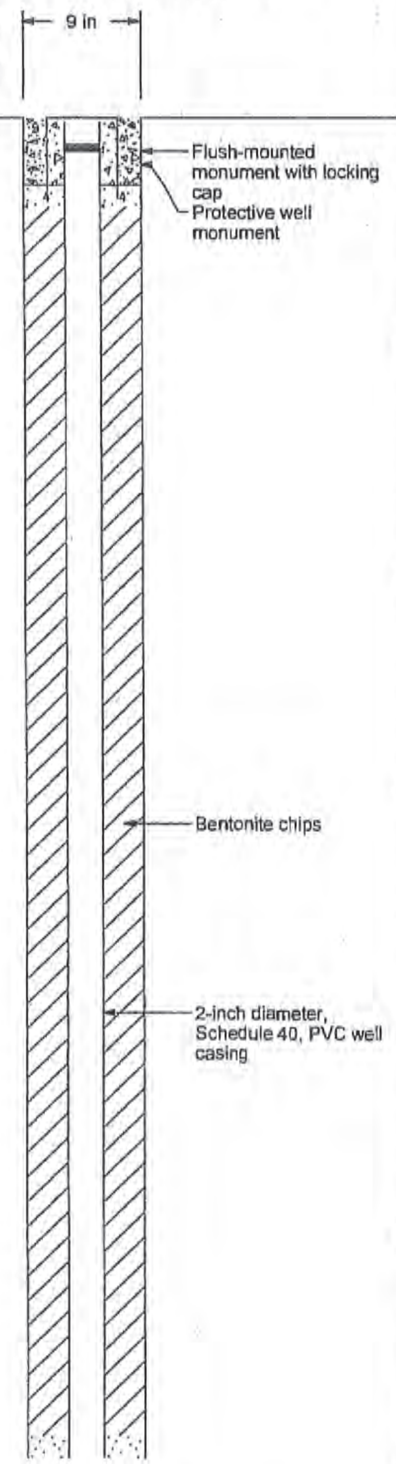
Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 240.49

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	USCS Symbol	Description
0	1	a1	13	0	SM	Brown, silty, gravelly, fine to medium SAND, no odor, no sheen (loose to medium dense, moist) (fill)
					SP	Brown, gravelly, fine to medium SAND with trace silt and trace wood fragments, no odor, no sheen (dense, damp to dry)
5	2	a1	47	0		
					SP-SM	Brown, gravelly, fine to medium SAND with silt, no odor, no sheen (dense, moist) (outwash)
10	3	a1	85	0		@ 10 ft: becomes very dense
					SP	Brown, fine to medium SAND with trace silt, no odor, no sheen (very dense, damp) (advance outwash)
15	4	a1	50/ 6"	0		
20	5	a1	50/ 5"	0		
25	6	a1	86	0		
30	8	a1	50/ 6"	0		

Water Level

Monitoring Well Detail



Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. DOE Well ID APN 669

934001.10 6/8/07 \EDMDATA\PROJECTS\934001\FILERMITWELLCO-1\934001.GPJ WELL LOG

LANDAU ASSOCIATES

Former Aladdin Plating Facility
Tacoma, Washington

Log of Monitoring Well MW1s

Figure A-2 (1 of 2)

MW1s

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Drilling Method: Hollow-stem Auger Ground Elevation (ft): 240.49	Water Level / Monitoring Well Detail
30						SP	Brown, fine to medium SAND with trace silt, no odor, no sheen (very dense, damp) (advance outwash) @ 30: ft fining with depth (wet)	
								ATD
35	9	a1	50/ 6"	0				2/12 Silica Sand Pack 2-inch diameter, Schedule 40, PVC screen (0.020-inch slot size)
40	10	a1	50/ 6"	0				Threaded end cap

Boring Completed 11/16/05
Total Depth of Boring = 42.0 ft.

Monitoring Well Completed 11/16/05
Total Depth of Monitoring Well = 42.3 ft.

45

50

55

60

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. DOE Well ID APN 669

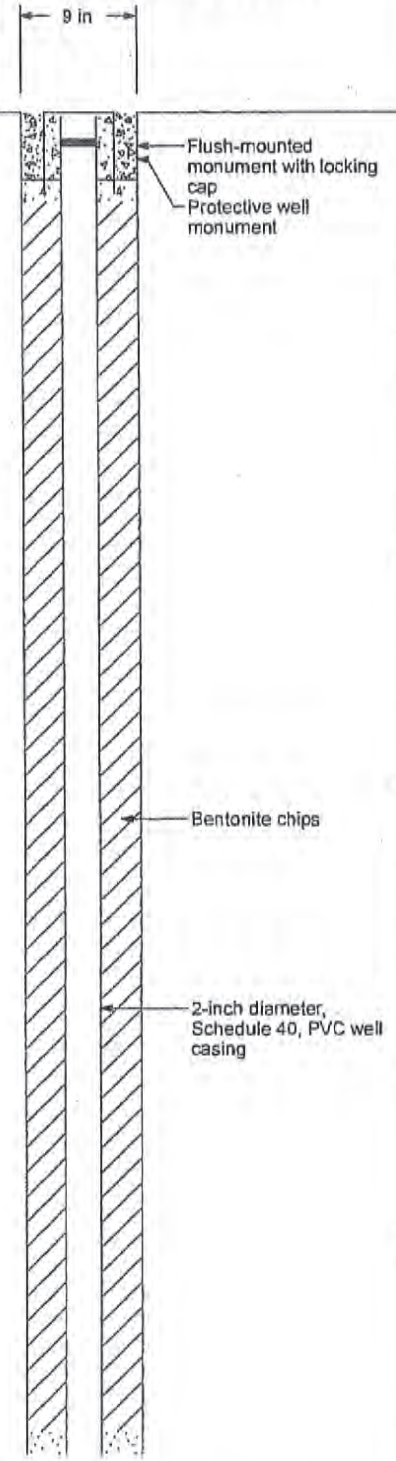
MW2s

SAMPLE DATA					SOIL PROFILE	
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	USCS Symbol	Drilling Method: Hollow-stem Auger Ground Elevation (ft): 240.46
0	1	a1	17	0	SP-SM	Brown, gravelly, fine to medium SAND with silt, no odor, no sheen (medium dense,dry) (fill)
5	2	a1	53	0		@ 5 ft: Bright orange (dense)
					SP	Brown, fine to medium SAND with gravel, no odor, no sheen (very dense, moist) (advance outwash)
10	3	a1	62	0		
15	4	a1	63	0		@ 14.5 ft: with trace silt (dry)
20	5	a1	50/ 6"	0		@ 19.5 ft: Fining with depth, trace gravel
25	6	a1	87	0		
30			50/			

GROUNDWATER

Water Level

Monitoring Well Detail



Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. DOE Well ID APN 673

934001.10 6/8/07 \EDMDATA\PROJECTS\934\001\FILERM\TWELLCO~1\934001.GPJ WELL LOG

LANDAU ASSOCIATES

Former Aladdin Plating Facility
Tacoma, Washington

Log of Monitoring Well MW2s

Figure A-3 (1 of 2)

MW2s

SAMPLE DATA | SOIL PROFILE | GROUNDWATER

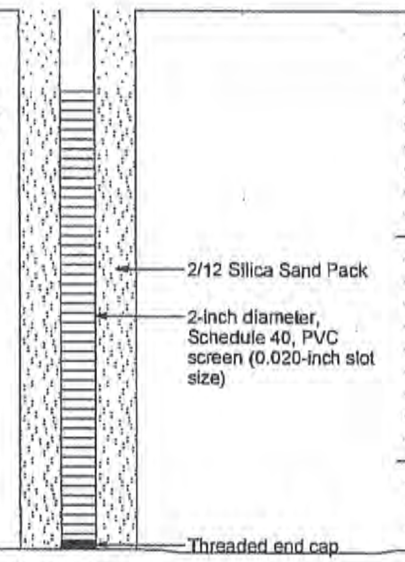
Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 240.46

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Description	Water Level
30	8	a1	6"	0		SP	@ 29.5 ft: light brown with faint oxidation laminations Brown, fine to medium SAND with gravel, no odor, no sheen (very dense, moist) (advance outwash)	ATD
35	9	a1	50/6"	0			@ 34.5 ft: light gray	
40	10	a1	50/6"	0				

Boring Completed 11/16/05
Total Depth of Boring = 42.0 ft.

Monitoring Well Detail



Monitoring Well Completed 11/16/05
Total Depth of Monitoring Well = 41.9 ft.

Depth (ft): 45, 50, 55, 60

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. DOE Well ID APN 673

LANDAU ASSOCIATES | Former Aladdin Plating Facility, Tacoma, Washington | Log of Monitoring Well MW2s | Figure A-3 (2 of 2)

MW3s

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Drilling Method: Hollow-stem Auger Ground Elevation (ft): 240.32	Water Level / Monitoring Well Detail (9 in)
0	464400	d4	10	0		SP-SM	Brown, gravelly, fine to medium SAND with silt, no odor, no sheen (loose; moist) (outwash)	Flush-mounted monument with locking cap; Protective well monument
5	464401	a1	10	0			@ 5 ft: medium dense	
10	464402	a1	14	0			@10 ft: Brown with trace oxidation staining.	
						SP	Brown, fine to medium SAND with trace silt, no odor, no sheen (very dense, damp) (advance outwash)	
15	464403	a1	50/ 6"	0				Bentonite chips
20	464404	a1	50/ 6"	0			@ 20 ft: with trace gravel	2-inch diameter, Schedule 40, PVC well casing
25	464405	a1	50/ 5"	0				
	464406	a1	50/ 4"	0				
30								

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. DOE Well ID APN 670

934001.10 6/6/07 \\EDMDATA\PROJECTS\934\001\FILERM\T\WELLCO-1\934001.GPJ WELL LOG

LANDAU ASSOCIATES

Former Aladdin Plating Facility
Tacoma, Washington

Log of Monitoring Well MW3s

Figure A-4 (1 of 2)

MW3s

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	USCS Symbol	Soil Profile Description
30	464407	a1	50/ 2"	0	SP	Brown, fine to medium SAND with trace silt, no odor, no sheen (very dense, damp) (advance outwash)
	464408	a1	50/ 5"	0		@ 31: Light gray (wet)
	464409	a1	50/ 6"	0		
35	464410	a1	50/ 5"	0		@ 35 ft: faint oxidation laminations.
	464411	a1	50/ 3"	0	SM	Light brown, silty, fine to medium SAND, no odor, no sheen (very dense, wet)
40	464412	a1	50/ 5"	0	ML	Brown-orange, non -plastic SILT, no odor, no sheen, homogenous (very stiff to hard, damp)
					GP	Gray, rounded, sandy, fine GRAVEL with trace silt, no odor, no sheen (medium dense, wet)
45	464413	a1	50/ 4"	0		
					SP	Gray, fine to medium gravelly SAND with trace silt, no odor, no sheen (very dense, wet)
50	464414	a1	50/ 6"	0		
55						
60						

Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 240.32

GROUNDWATER

Water Level: ATD

Monitoring Well Detail

Boring Completed 11/16/05
Total Depth of Boring = 55.0 ft.

Monitoring Well Completed 11/14/05
Total Depth of Monitoring Well = 40.3 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. DOE Well ID APN 670

934001.10 6/8/07 \\EDMDATA\PROJECTS\934\001\FILERMIT\WELLCO~1\934001.GPJ WELL LOG

LANDAU ASSOCIATES

Former Aladdin Plating Facility
Tacoma, Washington

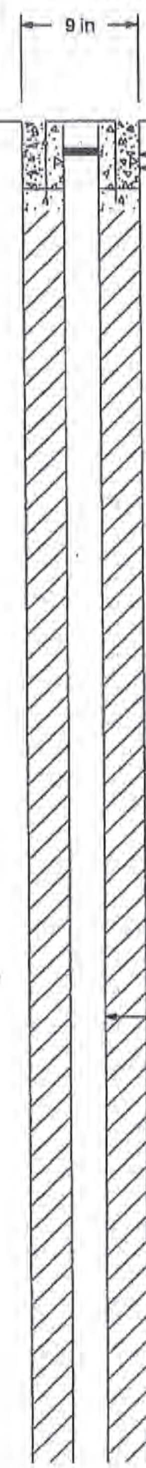
Log of Monitoring Well MW3s

Figure A-4 (2 of 2)

MW4d

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Drilling Method: Hollow-stem Auger Ground Elevation (ft): 240.75	Water Level
0	464422	a1	10	0		SM	Brown, silty, gravelly, fine to medium SAND, no odor, no sheen (loose to medium dense, moist) (fill)	
						SP-SM	Brown, gravelly, fine to medium SAND with silt, no odor, no sheen (loose, moist) (outwash)	
5	464416	a1	2	0				
10	464417	a1	13	0				
15	464418	a1	63	0			@ 15 ft: becomes very dense	
						SP	Brown, fine to medium SAND with trace silt, no odor, no sheen (very dense, damp) (advance outwash)	
20	464419	a1	50/6"	0				
25	464420	a1	50/4"	0				
30								

Monitoring Well Detail



Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. DOE Well ID APN 671

934001.10 6/8/07 WEDMDATA\PROJECTS\934\001\FILERMIT\WELLCO-1\934001.GPJ WELL LOG

LANDAU ASSOCIATES

Former Aladdin Plating Facility
Tacoma, Washington

Log of Monitoring Well MW4d

Figure A-5 (1 of 3)

MW4d

SAMPLE DATA / SOIL PROFILE / GROUNDWATER

Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 240.75

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	USCS Symbol	Description	Water Level
30	464421	a1	50/ 4"	0	SP	Brown, fine to medium SAND with trace silt, no odor, no sheen (very dense, damp) (advance outwash) @ 30: ft fining with depth (wet)	
35	464423	a1	50/ 5"	0		@ 35 ft: faint oxidation laminations.	ATD
40	464424	a1	50/ 6"	0	ML	Brown-orange, non -plastic SILT, no odor, no sheen, homogenous (very stiff to hard, damp)	
					GP	Gray, rounded, sandy, fine GRAVEL with trace silt, no odor, no sheen (medium dense, wet)	
50	464425	a1	50/ 6"	0			
					SP	Gray, fine to medium SAND with trace gravel, no odor, no sheen (dense, wet)	
55	464426	a1	50/ 5"	0			
60							

Monitoring Well Detail

Bentonite chips

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. DOE Well ID APN 671

934001.10 5/8/07 \\EDMDATA\PROJECTS\934001\FILERMITWELLCO~1\934001.GPJ WELL LOG

LANDAU ASSOCIATES

Former Aladdin Plating Facility
Tacoma, Washington

Log of Monitoring Well MW4d

Figure A-5 (2 of 3)

MW4d

Drilling Method: Hollow-stem Auger

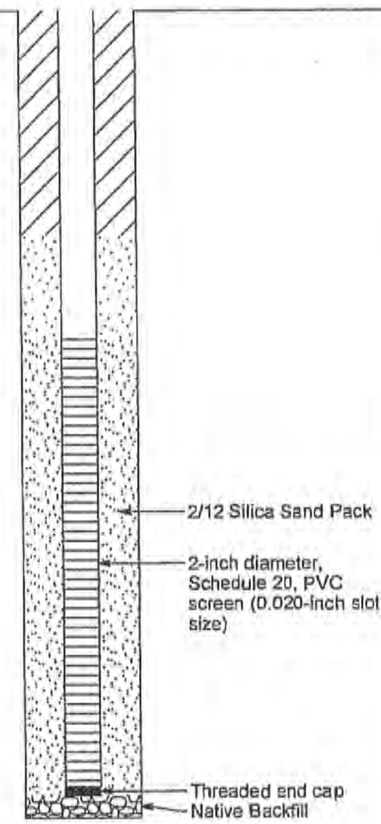
Ground Elevation (ft): 240.75

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	USCS Symbol	Description
60					SM	Brown with trace orange staining, silty, fine to medium SAND, no odor, no sheen (very dense, wet)
65	464427	a1	50/ 2"	0		
					GM	Gray, very silty, subrounded to subangular GRAVEL, no odor, no sheen (very dense, wet)
70	464428	a1	50/ 3"	0		
					GP-GM	Gray, subangular, sandy GRAVEL with silt, no odor, no sheen (very dense, wet)
		a1	50/ 3"	0		
75	464429	a1	50/ 6"	0	SP	Black with trace red grains, fine to medium SAND with trace silt, no odor, no sheen (very dense, wet)
80						

Boring Completed 11/14/05
Total Depth of Boring = 80.0 ft.

GROUNDWATER

Monitoring Well Detail



Monitoring Well Completed 11/15/05
Total Depth of Monitoring Well = 77.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. DOE Well ID APN 671

934001.10 6/8/07 \EDMDATA\PROJECTS\934\001\FILERM\TWELLCO~1\934001.GPJ WELL LOG

LANDAU ASSOCIATES

Former Aladdin Plating Facility Tacoma, Washington	Log of Monitoring Well MW4d	Figure A-5 (3 of 3)

MW4s

SAMPLE DATA					SOIL PROFILE			GROUNDWATER	
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Drilling Method: Hollow-stem Auger Ground Elevation (ft): 240.36	Water Level	Monitoring Well Detail (9 in)
0						SM	Brown, silty, gravelly, fine to medium SAND, no odor, no sheen (loose to medium dense, moist) (fill) *samples not collected; lithology inferred from MW-4d*		Flush-mounted monument with locking cap; Protective well monument
						SP-SM	Brown, gravelly, fine to medium SAND with silt, no odor, no sheen (loose, moist) (outwash) *samples not collected; lithology inferred from MW-4d*		
5									
10									
15							@ 15 ft: becomes very dense		Bentonite chips
						SP	Brown, fine to medium SAND with trace silt, no odor, no sheen (very dense, damp) (advance outwash) *samples not collected; lithology inferred from MW-4d*		
20									2-inch diameter, Schedule 40, PVC well casing
25									
30									

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. DOE Well ID APN 672

934001.10 6/8/07 \\EDMDATA\PROJECTS\934\001\FILERM\TWELLCO~1\934001.GPJ WELL LOG

LANDAU ASSOCIATES

Former Aladdin Plating Facility
Tacoma, Washington

Log of Monitoring Well MW4s

Figure A-6 (1 of 2)

MW4s

SAMPLE DATA					SOIL PROFILE			GROUNDWATER	
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Drilling Method: Hollow-stem Auger Ground Elevation (ft): 240.36	Water Level	Monitoring Well Detail
30						SP	Brown, fine to medium SAND with trace silt, no odor, no sheen (very dense, damp) (advance outwash) *samples not collected; lithology inferred from MW-4d* @ 30: ft fining with depth (wet)	ATD	2/12 Silica Sand Pack
35							@ 35 ft: faint oxidation laminations.		2-inch diameter, Schedule 40, PVC screen (0.020-inch slot size)
40									Threaded end cap

Boring Completed 11/15/05
Total Depth of Boring = 40.0 ft.

Monitoring Well Completed 11/15/05
Total Depth of Monitoring Well = 40.0 ft.

45

50

55

60

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. DOE Well ID APN 672

934001.10 6/8/07 \\EDMDATA\PROJECTS\934\001\FILERM\T\WELLCO~1\934001.GPJ WELL LOG

LANDAU ASSOCIATES

Former Aladdin Plating Facility
Tacoma, Washington

Log of Monitoring Well MW4s

Figure A-6 (2 of 2)

ATTACHMENT 5
Construction Stormwater Pollution Prevention Plan (SWPPP)

Ian Young

From: Kourehdar, Mohsen (ECY) <mkou461@ECY.WA.GOV>
Sent: Friday, August 7, 2015 8:25 AM
To: Ian Young
Subject: FW: Aladdin Plating Co (FSID 1277) - Good news

Hi Ian,

I got the email on construction stormwater permit. Please attach this to EDR. Thanks, Mohsen

---

From: Serdar, Carol (ECY)
Sent: Thursday, August 06, 2015 5:27 PM
To: Kourehdar, Mohsen (ECY) <mkou461@ECY.WA.GOV>
Cc: Cornett, Deborah (ECY) <DCOR461@ECY.WA.GOV>
Subject: Aladdin Plating Co (FSID 1277)

Good afternoon Mohsen,
I am not able to find an email from Ian Young, so I am sending this to you and request that you forward to Ian. I have left him a voicemail letting him know I am sending this email to you.

This email pertains to the above mentioned site located at 1657 Center St Tacoma, WA 98409.

The Southwest Regional Office – Water Quality Program regulates Construction Stormwater General Permits (CSWGP). The CSWGP condition S1. (Permit Coverage section) describes the Permit Coverage requirements. This includes "clearing, grading and/or excavation that results in the disturbance of one or more acres **and** discharges stormwater to surface waters of the State." (CSWGP condition S1. B. 1. a.)

In some instances, Ecology requires a CSWGP for sites that are less than one acre if "any size construction activity discharging stormwater to waters of the State that the Department of Ecology: i. Determines to be a significant contributor of pollutants to waters of the State of Washington. ii. Reasonably expects to cause a violation of any water quality standard." (CSWGP condition S1. B. 2. a. and b.)

After discussing the remediation plans and reviewing the site, Ecology determined the remediation activities planned for the site do not require a CSWGP. If conditions of the site or remediation plans change, a CSWGP may be required.

If you have any questions about this email or site conditions change, contact me at one of the phone numbers below. Thank you.
Sincerely,
Carol

Carol F. Serdar, LG
Hydropower Compliance Manager and
Contaminated Construction Stormwater Inspector
WA Department of Ecology - SWRO
Water Quality Program - Watershed Resources Unit
PO Box 47775
Olympia, WA 98504-7775

360.407.6269 desk

Stormwater Pollution Prevention Plan

For
~

Prepared For
Southwest Regional Office
300 Desmond Drive
Olympia, WA 98503
360-407-6300

Owner	Developer	Operator/Contractor
Washington State Department of Ecology	~	TBD
PO Box 47600	~	~
Olympia, WA 98504-7600	~	~

Project Site Location

1657 Center Street
Tacoma, Washington

Certified Erosion and Sediment Control Lead
TBD
~

SWPPP Prepared By
GeoEngineers
John Farleigh, PE
600 Stewart Street, Suite 1700
Seattle, Washington 98101

SWPPP Preparation Date
June, 2015

Approximate Project Construction Dates
September, 2015 to
November, 2015

Contents

Appendix A Site plans
- Vicinity map (with all discharge points)
- Site plan with TESC measures

Appendix B Construction BMPs
- Possibly reference in BMPs, but likely it will be a consolidated list so that the applicant can photocopy from the list from the SWMM.

Appendix C Alternative Construction BMP list
- List of BMPs not selected, but can be referenced if needed in each of the 12 elements

Appendix D General Permit

Appendix E Site Log and Inspection Forms

Appendix F Engineering Calculations
- Temporary Runoff Storage Calculation

Appendix G Remedial Investigation Report
- GeoEngineers RI, 2014

1.0 Introduction

This Stormwater Pollution Prevention Plan (SWPPP) has been prepared as part of the NPDES stormwater permit requirements for the Aladdin Plating Site Remediation Project in Tacoma, Washington. The site is located at 1657 Center Street. It's bound by South Alaska Street to the west and Center Street to the south. An industrial metal recycling site borders the north and east sides of the parcel. The Site (project area) is a rectangular corner parcel measuring approximately 80 feet long and 30 feet wide (2,400 square feet). Currently there are no structures or buildings. However, the site was historically used for commercial electroplating between 1958 and 1994. For more information about the current site and contaminates of concern see the Existing Conditions, Section 2.1. The proposed construction activity will include remediation of the site including excavation (removal of contaminated soil and backfill with suitable fill), and landscaping restoration. The intent is to remove contaminated material from the site to restore the site for future development.

The purpose of this SWPPP is to describe the proposed construction activities and all temporary and permanent erosion and sediment control (TESC) measures, pollution prevention measures, inspection/monitoring activities, and recordkeeping that will be implemented during the proposed construction project. The objectives of the SWPPP are to:

1. **Implement Best Management Practices (BMPs) to prevent erosion and sedimentation, and to identify, reduce, eliminate or prevent stormwater contamination and water pollution from construction activity.**

2. **Prevent violations of surface water quality, ground water quality, or sediment management standards.**

3. **Prevent, during the construction phase, adverse water quality impacts including impacts on beneficial uses of the receiving water by controlling peak flow rates and volumes of stormwater runoff at the Permittee's outfalls and downstream of the outfalls.**

This SWPPP was prepared using the Ecology SWPPP Template downloaded from the Ecology website on June 1, 2015. T**his SWPPP was prepared based on the requirements set forth in the Construction Stormwater General Permit, *Stormwater Management Manual for Western Washington* (SWMMWW), 2012 edition**. The report is divided into seven main sections with several appendices that include stormwater related reference materials. The topics presented in the each of the main sections are:

- Section 1 – INTRODUCTION. This section provides a summary description of the project, and the organization of the SWPPP document.

- Section 2 – SITE DESCRIPTION. This section provides a detailed description of the existing site conditions, proposed construction activities, and calculated stormwater flow rates for existing conditions and post–construction conditions.

- Section 3 – CONSTRUCTION BMPs. This section provides a detailed description of the BMPs to be implemented based on the 12 required elements of the SWPPP (SWMMEW 2004).

- Section 4 – CONSTRUCTION PHASING AND BMP IMPLEMENTATION. This section provides a description of the timing of the BMP implementation in relation to the project schedule.

- Section 5 – POLLUTION PREVENTION TEAM. This section identifies the appropriate contact names (emergency and non-emergency), monitoring personnel, and the onsite temporary erosion and sedimentation control inspector

- Section 6 – INSPECTION AND MONITORING. This section provides a description of the inspection and monitoring requirements such as the parameters of concern to be monitored, sample locations, sample frequencies, and sampling methods for all stormwater discharge locations from the site.

- Section 7 – RECORDKEEPING. This section describes the requirements for documentation of the BMP implementation, site inspections, monitoring results, and changes to the implementation of certain BMPs due to site factors experienced during construction.

Supporting documentation and standard forms are provided in the following Appendices:

Appendix A – Site Plans
Appendix B – Construction BMPs
Appendix C – Alternative Construction BMP list
Appendix D – General Permit
Appendix E – Site Log and Inspection Forms
Appendix F – Engineering Calculations
Appendix G – Remedial Investigation Report
Appendix H – WAC 173-201A-240: Toxic Substances

2.0 Site Description

2.1 Existing Conditions

Site Location and Ground Cover Characterization

The site is located at 1657 Center Street. It's bound by South Alaska Street to the west and Center Street to the south. An industrial metal recycling site borders the north and east sides of the parcel. The Site (project area) is a rectangular corner parcel measuring approximately 80 feet long and 30 feet wide (2,400 square feet). Currently there are no structures or buildings. However, the site was historically used for commercial electroplating between 1958 and 1994. Chemicals present at the site have included chromium, nickel, caustic soda, sulfuric acid, and alkaline cleaners. Contaminants of concern are total chromium, hexavalent chromium, lead, and nickel. The Site is currently owned by Pierce County and is managed by Ecology as an orphan contaminated site. The Remedial Investigation report contains more information about soil and contaminate characterization, attached in Appendix G. The site is currently unpaved and secured by temporary fencing. There are no critical areas on the site such as high erosion risk areas, wetlands, streams, or steep slopes (potential landslide area). A majority of the parcel consists of un-vegetated fill and gravel ground cover. Some shrubs and grasses have grown in low traffic areas due to natural processes (not landscaped).

Topography

The slopes mildly from north to south at approximate elevation 250 feet. Estimated slopes range from 2-5%. Just upland, to the north, there is a bluff which rises approximately 80 feet above the site. The current topography appears to deviate from the "natural" topography," indicating that the site has been shaped by previous excavation activity. Though the slopes onsite are generally mild, there is potential for run-on from upstream areas. Mitigation for runoff management should include considerations for intercepting upstream runoff before it joins runoff from the site.

Hydrology

Tacoma is comprised of nine sub-watersheds for stormwater management. The site is located in the Foss Waterway Basin. The Foss Waterway Basin drains to the Puyallup River. It covers approximately 5,781 acres in south-central Tacoma including residential and industrial developments in Tacoma's tide flats and the Nalley Valley.

Runoff from the site generally drains from north to south. The site doesn't currently have stormwater collection system. So, runoff would flow downhill to the public storm system located in Center Street. The Center Street storm line consists of a 72-inch diameter line that flows east to Cushman Avenue. There, it turns south and flows in the 72-inch line to the Burlington Railroad. The storm line follows the Burlington corridor east to South Tacoma Way. It joins the storm line in South Tacoma Way and continues east-northeast until it reaches the outfall at Commencement Bay (source: govME.com; City of Tacoma).

Commencement Bay is on Ecology's 303d list for contaminates, 47 listings were found on the online search. Parameters with less than a category 4 have not been listed here. Category 4 and 5 parameters are:

- Category 4B; listing ID 512688, Sediment Bioassay, Medium: Sediment;
- Category 5; listing ID: 35738, PCB, Medium: Tissue.

The contaminates listed on the 303d list for Commencement Bay aren't prevalent at the project site.

Soils

Soil across the property was generally characterized as brown silty sand to sand with silt, with varying gravel content. No definitive geologic contact was identified delineating fill material from native soils. Perched groundwater was noted in some boring cores at depths ranging from approximately 6.5 to 8 feet bgs. Soil types encountered in exploration borings downgradient of the Site generally consisted of brown silty sand to sand with silt with varying gravel content, and occasional poorly graded gravel layers up to 2 feet in thickness to depths of approximately 13 to 20 feet bgs; at depths from approximately 15 feet bgs to the explored depth of 35 to 40 feet bgs, soil was generally characterized as brown to grey, fine to medium sand with occasional gravel and silt content, and occasional poorly graded gravel layers. The geology in the vicinity of the Site is described in the Geologic map of the south half of the Tacoma Quadrangle, Pierce County, Washington (Walsh, 1987). Soils at the site are mapped as Vashon glacial drift overlying Vashon till. North of the Site soils are identified as Vashon till.

Groundwater at the Site occurs primarily in the fine to medium sand unit with occasional gravel and silt (the "shallow aquifer"). The shallow groundwater aquifer was encountered at depths ranging from 21.5 to 27 feet bgs. The groundwater flow direction at the Site is to the east-southeast.

Previous site investigations have identified a "Shallow Aquifer" that consists of very permeable coarse sand with gravel and cobbles. The top of the aquifer depth varies based on existing topography; generally the top is approximately 40 feet below ground surface and the bottom extends to 70 to 90 feet below ground surface (Landau Associates et al, 2005).

2.2 Proposed Construction Activities

The proposed development includes the remedial excavation to remove contaminated soils from the site. After remediation is complete suitable soil fill will be imported. The final topography will mimic the existing grades. Once excavation activities have been completed the site will be seeded, as a minimum final stabilization.

Remedial excavation will be performed at the Site to remove soil that was identified to contain metals at concentrations greater than the Site-specific cleanup standards developed in the RI and adopted in the FS that may be a source of metals leaching to groundwater. The results of chemical analyses on soil samples from borings performed at the Site identified the presence of chromium, lead, and nickel at concentrations greater than their respective Site-specific cleanup criteria are summarized in figures displaying contaminant concentrations in soil.

The initial limits of excavation have been identified based on the results of previous investigation. When the limits of excavation have been reached, verification samples will be collected from the sidewalls and base (i.e., bottom) of each excavation by the Engineer in accordance with the Compliance Monitoring Plan prepared for the Aladdin Plating Remediation Project and analyzed at a chemical analytical laboratory.

Where the verification sample results are less than the Site-specific cleanup criteria, no further excavation will be performed. Where the verification sample results are greater than the criteria, additional excavation will be performed, as directed by the Engineer, to remove soil with concentrations greater than the criteria. Following any additional excavation, additional verification samples will be collected by the Engineer and analyzed to verify that the remaining soil meets the criteria. The excavations will be backfilled after verification sampling indicates that the contaminated soil removal has been completed.

The soil excavated from the Site will be stockpiled for characterization in accordance with the Compliance Monitoring Plan prior to disposal. Samples of stockpiled soil removed from the excavation will be collected by the Engineer and analyzed at a chemical analytical laboratory. The results from stockpiled soil sampling and analysis will be compared to landfill disposal criteria by the Engineer to identify the appropriate disposal location. The Engineer will transmit the sample results to the landfill for authorization and acceptance of the stockpiled material for disposal. Upon receipt of authorization and acceptance for disposal, the Contractor shall transport the stockpiled material to the landfill for disposal and provide the documentation of disposal to the Engineer. Sampling and analysis, comparison of the sample results to landfill criteria, and acceptance of the stockpiled material by the landfill will be performed/obtained prior to transport of the stockpiled soil to a landfill for disposal.

Construction is scheduled to be completed during the dry summer months to limit further contamination of surface runoff. During construction if a rain event occurs or ground water is encountered temporary pumps will be used to pump water from the bottom of the excavation to temporary storage tanks. The Aladdin Plating Site has been exempted from the Washington State Construction Stormwater General Permit because less than one acre of disturbance will occur as part of the remedial action project and stormwater does not discharge to surface water. All stormwater that is collected as part of the remedial action and any water resulting from dewatering of excavations or excavated material, dust control, and decontamination activities on the Site will be discharged to the completed remedial excavation for infiltration. No sampling or analysis will be necessary prior to discharge. Section 3.0 Construction Runoff BMPs contains information about temporary runoff storage tank sizing and stormwater discharge requirements.

Safe stormwater discharges shall generally comply with the terms of the Construction Stormwater General Permit and WAC 173-201A-240.

To optimize worker safety workers should be aware that soil disturbance is occurring in a contaminated area. Methods to promote worker safety will be consist of wearing personal protection equipment appropriate for the job. Avoid ingestion by inhalation of contaminated dust particles by controlling dust and incidental contact with contaminated soils by containing soils onsite and cleaning all clothing and equipment prior to leaving the site. Reference workplace safety rules on toxic sites for arsenic in chapter 296 of the WAC.

Stormwater runoff volumes were calculated using the Western Washington Hydrology Model (WWHM). The temporary runoff storage tanks that will be used during construction were designed using the 2-year storm event since construction will occur during the summer and the duration is anticipated to be relatively short.

The following summarizes details regarding site areas:

▪ Total site area:	0.055 acres
▪ Percent impervious area before construction:	0 %
▪ Percent impervious area after construction:	0 %
▪ Disturbed area during construction:	0.055 acres
▪ Disturbed area that is characterized as impervious (i.e., access roads, staging, parking):	0 acres
▪ 2-year stormwater runoff peak flow prior to construction (existing):	0.02 cfs
▪ 10-year stormwater runoff peak flow prior to construction (existing):	0.03 cfs
▪ 2-year stormwater runoff peak flow during construction:	0.02 cfs
▪ 10-year stormwater runoff peak flow during construction:	0.03 cfs
▪ 2-year stormwater runoff peak flow after construction:	0.02 cfs
▪ 10-year stormwater runoff peak flow after construction:	0.03 cfs

All stormwater flow calculations are provided in Appendix F.

3.0 Construction Stormwater BMPs

3.1 The 12 BMP Elements

3.1.1 Element #1 – Mark Clearing Limits

To protect adjacent properties and to reduce the area of soil exposed to construction, the limits of construction will be clearly marked before land-disturbing activities begin. Trees that are to be preserved, as well as all sensitive areas and their buffers, shall be clearly delineated, both in the field and on the plans. In general, natural vegetation and native topsoil shall be retained in an undisturbed state to the maximum extent possible. The BMPs relevant to marking the clearing limits that will be applied for this project include:

- BMP C102: High Visibility Fence

Alternate BMPs for marking clearing limits are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

3.1.2 Element #2 – Establish Construction Access

Construction access or activities occurring on unpaved areas shall be minimized, yet where necessary, access points shall be stabilized to minimize the tracking of sediment onto public roads, and wheel washing, street sweeping, and street cleaning shall be employed to prevent sediment from entering state waters. All wash wastewater shall be controlled on site. The specific BMPs related to establishing construction access that will be used on this project include:

- BMP C105: Stabilized Construction Entrance/Exit
- BMP C106: Wheel Wash

Alternate construction access BMPs are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and

Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

3.1.3 Element #3 – Control Flow Rates

In order to protect the properties and waterways downstream of the project site, stormwater discharges from the site will be controlled. The specific BMPs for flow control that shall be used on this project include:

- Flow rates will be controlled by collecting surface runoff in a temporary tank. Runoff will be monitored for contaminates prior to discharge.
- Discharges will be done in a controlled manner, utilizing man-made conveyance lines.

Alternate flow control BMPs are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

In general, discharge rates of stormwater from the site will be controlled where increases in impervious area or soil compaction during construction could lead to downstream erosion, or where necessary to meet local agency stormwater discharge requirements (e.g. discharge to combined sewer systems).

3.1.4 Element #4 – Install Sediment Controls

All stormwater runoff from disturbed areas shall pass through an appropriate sediment removal BMP before leaving the construction site or prior to being discharged to an infiltration facility. The specific BMPs to be used for controlling sediment on this project include:

- BMP C105: Stabilized Construction Entrance/Exit
- BMP C106: Wheel Wash
- BMP C123: Plastic Covering
- BMP C140: Dust Control

- BMP C150: Materials on Hand
- BMP C160: Certified Erosion and Sediment Control Lead
- BMP C162: Scheduling
- BMP C233: Silt Fence

Alternate sediment control BMPs are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

In addition, sediment will be removed from paved areas in and adjacent to construction work areas manually or using mechanical sweepers, as needed, to minimize tracking of sediments on vehicle tires away from the site and to minimize washoff of sediments from adjacent streets in runoff.

Whenever possible, sediment laden water shall be discharged into onsite, relatively level, vegetated areas (BMP C240 paragraph 5, page 4-102).

In some cases, sediment discharge in concentrated runoff can be controlled using permanent stormwater BMPs (e.g., infiltration swales, ponds, trenches). Sediment loads can limit the effectiveness of some permanent stormwater BMPs, such as those used for infiltration or biofiltration; however, those BMPs designed to remove solids by settling (wet ponds or detention ponds) can be used during the construction phase. When permanent stormwater BMPs will be used to control sediment discharge during construction, the structure will be protected from excessive sedimentation with adequate erosion and sediment control BMPs. Any accumulated sediment shall be removed after construction is complete and the permanent stormwater BMP will be restabilized with vegetation per applicable design requirements once the remainder of the site has been stabilized.

The following BMPs will be implemented as end-of-pipe sediment controls as required to meet permitted turbidity limits in the site discharge(s). Prior to the implementation of these technologies, sediment sources and erosion control and soil stabilization BMP efforts will be maximized to reduce the need for end-of-pipe sedimentation controls.

- Temporary Runoff Storage Tanks
- Construction Stormwater Filtration (BMP C251)

- Construction Stormwater Chemical Treatment (BMP C 250) (implemented only with prior written approval from Ecology).

3.1.5 Element #5 – Stabilize Soils

Exposed and unworked soils shall be stabilized with the application of effective BMPs to prevent erosion throughout the life of the project. The specific BMPs for soil stabilization that shall be used on this project include:

- BMP C120: Temporary and Permanent Seeding
- BMP C121: Mulching

Alternate soil stabilization BMPs are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

In general, cut and fill slopes will be stabilized as soon as possible and soil stockpiles will be temporarily covered with plastic sheeting. All stockpiled soils shall be stabilized from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.

3.1.6 Element #6 – Protect Slopes

All cut and fill slopes will be designed, constructed, and protected in a manner than minimizes erosion. The following specific BMPs will be used to protect slopes for this project:

- BMP C123: Plastic Covering

Alternate slope protection BMPs are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

3.1.7 Element #7 – Protect Drain Inlets

All storm drain inlets and culverts made operable during construction shall be protected to prevent unfiltered or untreated water from entering the drainage conveyance system. However, the first priority is to keep all access roads clean of sediment and keep street wash water separate from entering storm drains until treatment can be provided. Storm Drain Inlet Protection (BMP C220) will be implemented for all drainage inlets and culverts that could potentially be impacted by sediment-laden runoff on and near the project site. The following inlet protection measures will be applied on this project:

If the BMP options listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D), or if no BMPs are listed above but deemed necessary during construction, the Certified Erosion and Sediment Control Lead shall implement one or more of the alternative BMP inlet protection options listed in Appendix C.

3.1.8 Element #8 – Stabilize Channels and Outlets

Where site runoff is to be conveyed in channels, or discharged to a stream or some other natural drainage point, efforts will be taken to prevent downstream erosion. The specific BMPs for channel and outlet stabilization that shall be used on this project include:

- BMP C200: Interceptor Dike and Swale
- BMP C207: Check Dams
- BMP C209: Outlet Protection

Alternate channel and outlet stabilization BMPs are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

3.1.9 Element #9 – Control Pollutants

All pollutants, including waste materials and demolition debris, that occur onsite shall be handled and disposed of in a manner that does not cause contamination of stormwater. Good housekeeping and preventative measures will be taken to ensure that the site will be kept clean, well organized, and free of debris.

Contaminates may be spread on dust particles. Controlling contaminates shall include dust prevention measures such as dust control.

3.1.10 Element #10 – Control Dewatering

There is no anticipated dewatering as part of this construction project. If dewatering is required it shall be assumed that water has made contact with contaminates and shall; therefore, be subjected to the pollutant discharge thresholds described above.

3.1.11 Element #11 – Maintain BMPs

All temporary and permanent erosion and sediment control BMPs shall be maintained and repaired as needed to assure continued performance of their intended function. Maintenance and repair shall be conducted in accordance with each particular BMPs specifications (attached). Visual monitoring of the BMPs will be conducted at least once every calendar week and within 24 hours of any stormwater or non-stormwater discharge from the site. If the site becomes inactive, and is temporarily stabilized, the inspection frequency will be reduced to once every month.

All temporary erosion and sediment control BMPs shall be removed within 30 days after the final site stabilization is achieved or after the temporary BMPs are no longer needed. Trapped sediment shall be removed or stabilized on site. Disturbed soil resulting from removal of BMPs or vegetation shall be permanently stabilized.

3.1.12 Element #12 – Manage the Project

Erosion and sediment control BMPs for this project have been designed based on the following principles:

- Design the project to fit the existing topography, soils, and drainage patterns.
- Emphasize erosion control rather than sediment control.
- Minimize the extent and duration of the area exposed.
- Keep runoff velocities low.
- Retain sediment on site.
- Thoroughly monitor site and maintain all ESC measures.
- Schedule major earthwork during the dry season.

In addition, project management will incorporate the key components listed below:

As this project site is located <u>west</u> of the Cascade Mountain Crest, the project will be managed according to the following key project components:

Phasing of Construction

- The construction project is being phased to the extent practicable in order to prevent soil erosion, and, to the maximum extent possible, the transport of sediment from the site during construction.

- Revegetation of exposed areas and maintenance of that vegetation shall be an integral part of the clearing activities during each phase of construction, per the Scheduling BMP (C 162).

Seasonal Work Limitations

- From October 1 through April 30, clearing, grading, and other soil disturbing activities shall only be permitted if shown to the satisfaction of the local permitting authority that silt-laden runoff will be prevented from leaving the site through a combination of the following:

  - ☐ Site conditions including existing vegetative coverage, slope, soil type, and proximity to receiving waters; and

  - ☐ Limitations on activities and the extent of disturbed areas; and

  - ☐ Proposed erosion and sediment control measures.

- Based on the information provided and/or local weather conditions, the local permitting authority may expand or restrict the seasonal limitation on site disturbance.

- The following activities are exempt from the seasonal clearing and grading limitations:

  - ☐ Routine maintenance and necessary repair of erosion and sediment control BMPs;

  - ☐ Routine maintenance of public facilities or existing utility structures that do not expose the soil or result in the removal of the vegetative cover to soil; and

  - ☐ Activities where there is 100 percent infiltration of surface water runoff within the site in approved and installed erosion and sediment control facilities.

Coordination with Utilities and Other Jurisdictions

- Care has been taken to coordinate with utilities, other construction projects, and the local jurisdiction in preparing this SWPPP and scheduling the construction work.

Inspection and Monitoring

- All BMPs shall be inspected, maintained, and repaired as needed to assure continued performance of their intended function. Site inspections shall be conducted by a person who is knowledgeable in the principles and practices of erosion and sediment control. This person has the necessary skills to:

  - Assess the site conditions and construction activities that could impact the quality of stormwater, and

  - Assess the effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges.

- A Certified Erosion and Sediment Control Lead shall be on-site or on-call at all times.

- Whenever inspection and/or monitoring reveals that the BMPs identified in this SWPPP are inadequate, due to the actual discharge of or potential to discharge a significant amount of any pollutant, appropriate BMPs or design changes shall be implemented as soon as possible.

Maintaining an Updated Construction SWPPP

- This SWPPP shall be retained on-site or within reasonable access to the site.

- The SWPPP shall be modified whenever there is a change in the design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the state.

- The SWPPP shall be modified if, during inspections or investigations conducted by the owner/operator, or the applicable local or state regulatory authority, it is determined that the SWPPP is ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site. The SWPPP shall be modified as necessary to include additional or modified BMPs designed to correct problems identified. Revisions to the SWPPP shall be completed within seven (7) days following the inspection. ---

The BMP implementation schedule will be driven by the construction schedule. The following provides a sequential list of the proposed construction schedule milestones and the corresponding BMP implementation schedule. The list contains key milestones such as wet season construction.

The BMP implementation schedule listed below is keyed to proposed phases of the construction project, and reflects differences in BMP installations and inspections that relate to wet season construction. The project site is located west of the Cascade Mountain Crest. As such, the dry season is considered to be from May 1 to September 30 and the wet season is considered to be from October 1 to April 30.

- Mobilize equipment on site: Week 1
- Mobilize and store all ESC and soil stabilization products: Week 1
- Install ESC measures: Week 1
- Install stabilized construction entrance: Week 1
- Begin clearing and grubbing: Week 2
- Begin Excavation for Soil Remediation Week 2-4
- Backfill with Suitable Soil Week 3-4

5.0 Pollution Prevention Team

5.1 Roles and Responsibilities

The pollution prevention team consists of personnel responsible for implementation of the SWPPP, including the following:

- Certified Erosion and Sediment Control Lead (CESCL) – primary contractor contact, responsible for site inspections (BMPs, visual monitoring, sampling, etc.); to be called upon in case of failure of any ESC measures.

- Resident Engineer – For projects with engineered structures only (sediment ponds/traps, sand filters, etc.): site representative for the owner that is the project's supervising engineer responsible for inspections and issuing instructions and drawings to the contractor's site supervisor or representative

- Emergency Ecology Contact – individual to be contacted at Ecology in case of emergency. Go to the following website to get the name and number for the Ecology contact information: http://www.ecy.wa.gov/org.html.

- Emergency Owner Contact – individual that is the site owner or representative of the site owner to be contacted in the case of an emergency.

- Non-Emergency Ecology Contact – individual that is the site owner or representative of the site owner than can be contacted if required.

- Monitoring Personnel – personnel responsible for conducting water quality monitoring; for most sites this person is also the Certified Erosion and Sediment Control Lead.

5.2 Team Members

Names and contact information for those identified as members of the pollution prevention team are provided in the following table.

Title	Name(s)	Phone Number
Certified Erosion and Sediment Control Lead (CESCL), Site Inspector	TBD	~
Resident Engineer	TBD	~
Emergency Ecology Contact	Mohsen Kouredhar	o. 360.407.6256
Emergency Owner Contact	~	~
Non-Emergency Ecology Contact	Ian Young	c. 206.920.8635
Monitoring Personnel	Hannah McDonough	c. 802.249.3908

6.0 Site Inspections and Monitoring

Monitoring includes visual inspection, monitoring for water quality parameters of concern, and documentation of the inspection and monitoring findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements;
- Site inspections; and,
- Stormwater quality monitoring.

For convenience, the inspection form and water quality monitoring forms included in this SWPPP include the required information for the site log book. This SWPPP may function as the site log book if desired, or the forms may be separated and included in a separate site log book. However, if separated, the site log book but must be maintained on-site or within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

6.1 Site Inspection

All BMPs will be inspected, maintained, and repaired as needed to assure continued performance of their intended function. It is recommended that the inspector for this site be a Certified Erosion and Sediment Control Lead (CESCL) per BMP C160; however, it is not required for sites less than one acre. The name and contact information site inspector is provided in Section 5 of this SWPPP.

Site inspection will occur in all areas disturbed by construction activities and at all stormwater discharge points. Stormwater will be examined for the presence of suspended sediment, turbidity, discoloration, and oily sheen. The site inspector will evaluate and document the effectiveness of the installed BMPs and determine if it is necessary to repair or replace any of the BMPs to improve the quality of stormwater discharges. All maintenance and repairs will be documented in the site log book or forms provided in this document. All new BMPs or design changes will be documented in the SWPPP as soon as possible.

6.1.1 Site Inspection Frequency

Site inspections will be conducted at least once a week and within 24 hours following any discharge from the site. For sites with temporary stabilization measures, the site inspection frequency can be reduced to once every month. Runoff shall be sampled as needed prior to discharging.

6.1.2 Site Inspection Documentation

The site inspector will record each site inspection using the site log inspection forms provided in Appendix E. The site inspection log forms may be separated from this SWPPP document, but will be maintained on-site or within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

6.2 Stormwater Quality Monitoring

Sites less than one acre may have a person without CESCL certification conduct inspections; sampling is not typically required. However, this site contains contaminates so discharges shall be sampled and monitored as described below.

The following steps for inspection will be conducted:

1. Ensure all BMPs specified in this SWPPP are installed and functioning as intended.

2. Assess whether additional BMPs should be implemented, and document modified BMPs in the SWPPP as necessary.

7.0 Reporting and Recordkeeping

7.1 Recordkeeping

7.1.1 Site Log Book

A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements;
- Site inspections; and,
- Stormwater quality monitoring.

For convenience, the inspection form and water quality monitoring forms included in this SWPPP include the required information for the site log book.

This SWPPP may function as the site log book if the project has minimal monitoring requirements or construction duration is shorter than 2 to 3 months. The appendices can include multiple copies of the blank checklists and inspection forms as needed to supplement for the site log book. This is recommended for smaller, simple construction sites. This is the flexible and depends on the preference of the applicant. If the duration of the project is greater than 2 to 3 months or if there is significant monitoring requirements, it is recommended that a separate site log be maintained incorporating the example forms provided in this SWPPP Template document.

It is recommended that the site inspector create an online account using Ecology’s online Permitting and Reporting Information System (PARIS).

7.1.2 Records Retention

Records of all monitoring information (site log book, inspection reports/checklists, etc.), this Stormwater Pollution Prevention Plan, and any other documentation of compliance with permit requirements will be retained during the life of the construction project and for a minimum of three years following the termination of permit coverage in accordance with permit condition S5.C.

7.1.3 Access to Plans and Records

The SWPPP, General Permit, Notice of Authorization letter, and Site Log Book will be retained on site or within reasonable access to the site and will be made immediately available upon request to Ecology or the local jurisdiction. A copy of this SWPPP will be provided to Ecology within 14 days of receipt of a written request for the SWPPP from Ecology. Any other information requested by Ecology will be submitted within a reasonable time. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with permit condition S5.G.

7.1.4 Updating the SWPPP

In accordance with Conditions S3, S4.B, and S9.B.3 of the General Permit, this SWPPP will be modified if the SWPPP is ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site or there has been a change in design, construction, operation, or maintenance at the site that has a significant effect on the discharge, or potential for discharge, of pollutants to the waters of the State. The SWPPP will be modified within seven days of determination based on inspection(s) that additional or modified BMPs are necessary to correct problems identified, and an updated timeline for BMP implementation will be prepared.

7.2 Reporting

7.2.1 Discharge Monitoring Reports

Discharge Monitoring Reports (DMRs) will be tracked (collected) and submitted to the owner's representative monthly. If there was no discharge during a given monitoring period, the Permittee shall submit the form as required, with the words "No discharge" entered in the place of monitoring results. The DMR due date is 15 days following the end of each month.

It is recommended that the site inspector create an online account using Ecology's online Permitting and Reporting Information System (PARIS).

7.2.2 Notification of Noncompliance

If any of the terms and conditions of the permit are not met, and it causes a threat to human health or the environment, the following steps will be taken in accordance with permit section S5.F:

1. Ecology will be immediately notified of the failure to comply.

2. Immediate action will be taken to control the noncompliance issue and to correct the problem. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within five (5) days of becoming aware of the violation.

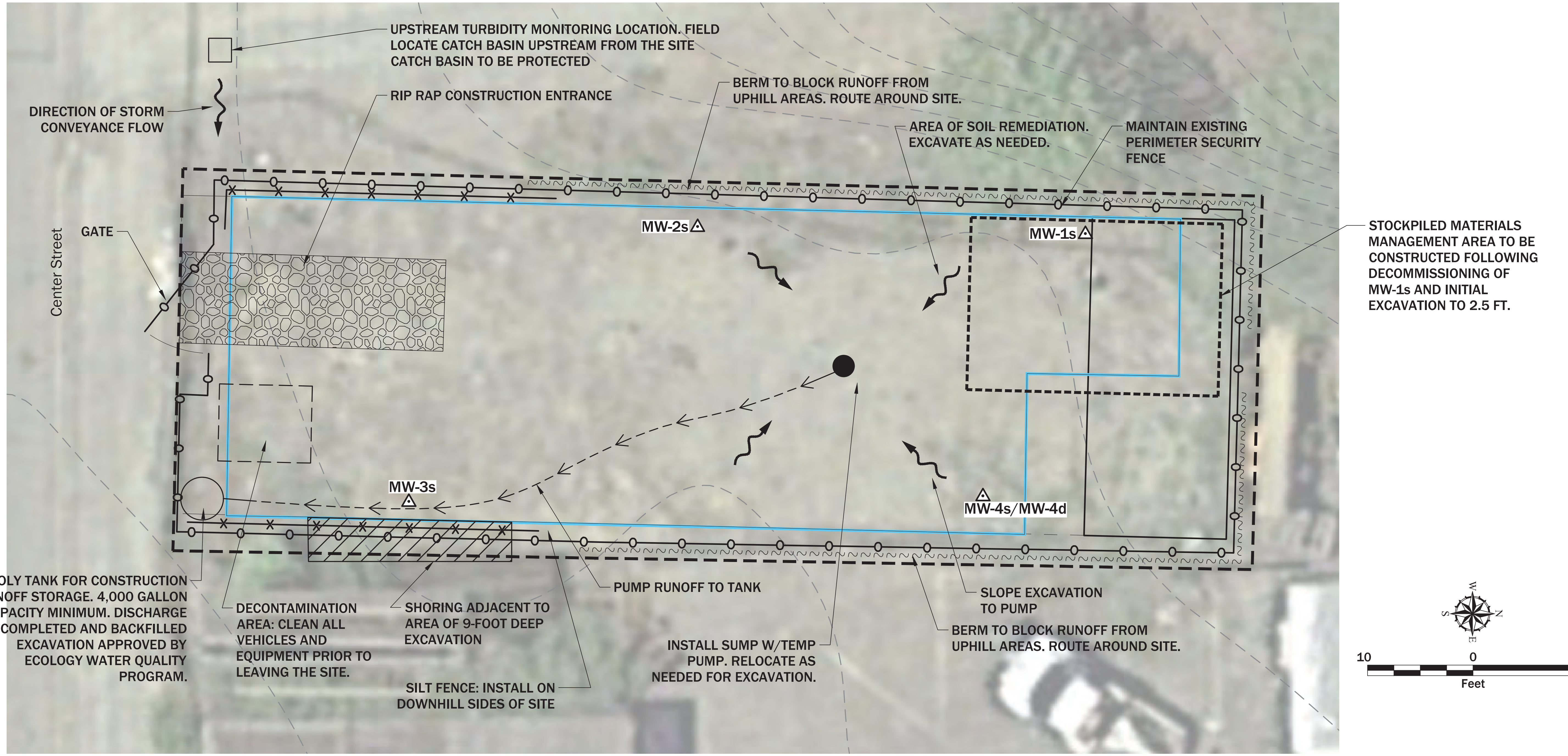
3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

In accordance with permit condition S2.A, a complete application form will be submitted to Ecology and the appropriate local jurisdiction (if applicable) to be covered by the General Permit.

Appendix A – Site Plans

Vicinity Map

Source: Pierce County Online PublicGIS Mapping



NOTES:

1. SITE CONTAINS CONTAMINATED SOIL. IF SOIL IS TRACKED INTO THE RIGHT–OF–WAY IMMEDIATELY CLEAN IT.

Revision No:	Date:	Description:	Initials:	Designed: IY
				Drawn: CMV/SCY
				Checked: DAC
				Date: 07–30–2015
				Project No: 0504–095–01

ALADDIN PLATING FACILITY
1657 CENTER STREET
TACOMA, WASHINGTON

DEPARTMENT OF ECOLOGY
State of Washington

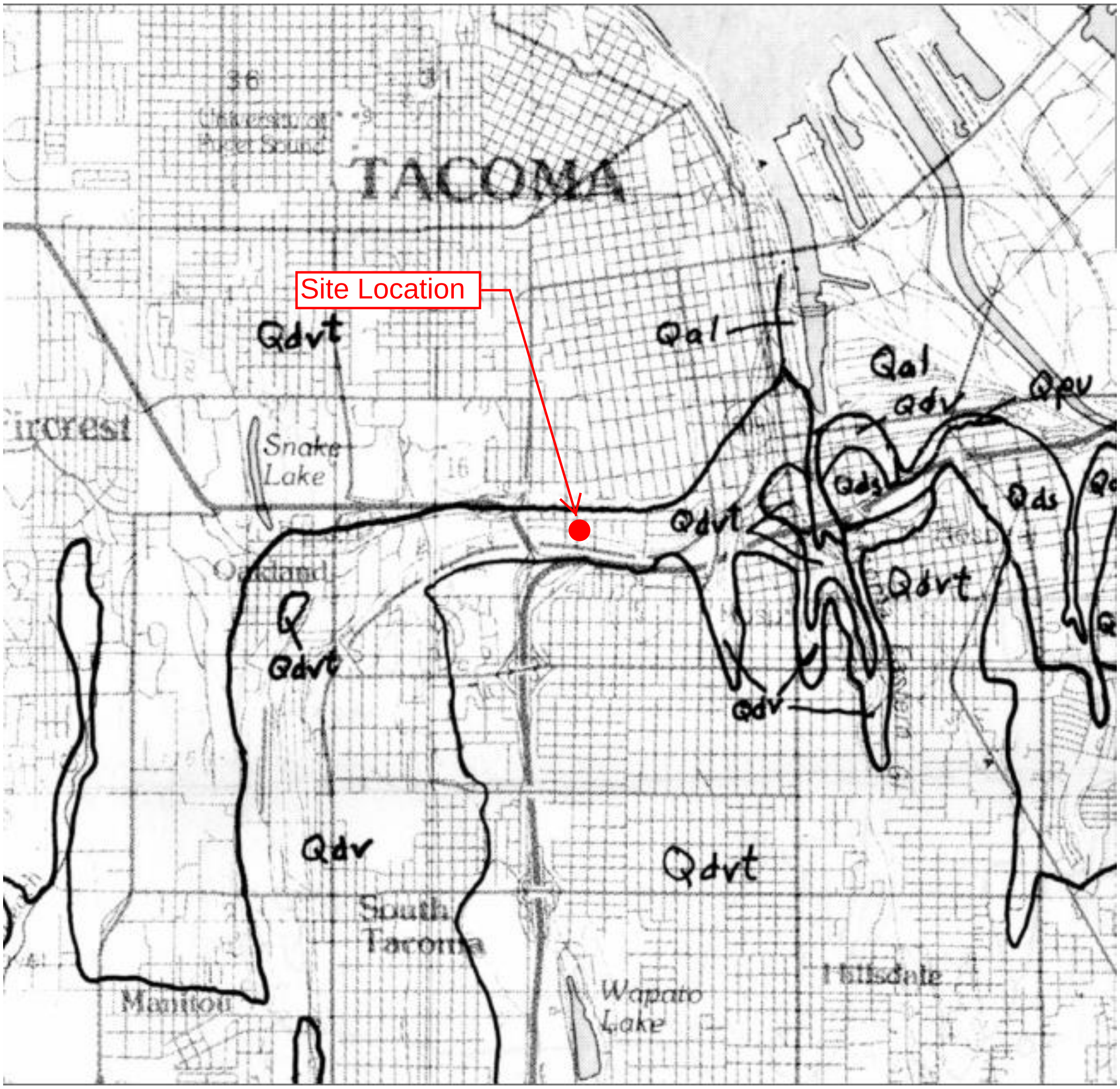
GEOENGINEERS
600 Stewart Street, Suite 1700
Seattle, Washington 98101

EXCAVATION AND TESC PLAN

CLEANUP ACTION PLAN

Sheet
S-04

Geologic Map



Title: Geologic map of the south half of the Tacoma quadrangle, Washington
Author(s): Walsh, T.J.
Publishing Organization: Washington Division of Geology and Earth Resources
Series and Number: Open File Report 87-3
Publication Date: 1987
Map Scale: 1:100,000
Cross Section: None
North Latitude: 47° 15' 0" N (47.2500)
South Latitude: 47° 0' 0" N (47.0000)
East Longitude: 122° 0' 0" W (-122.0000)
West Longitude: 123° 0' 0" W (-123.0000)

Topography Exhibit

Source: Pierce County Online PublicGIS Mapping

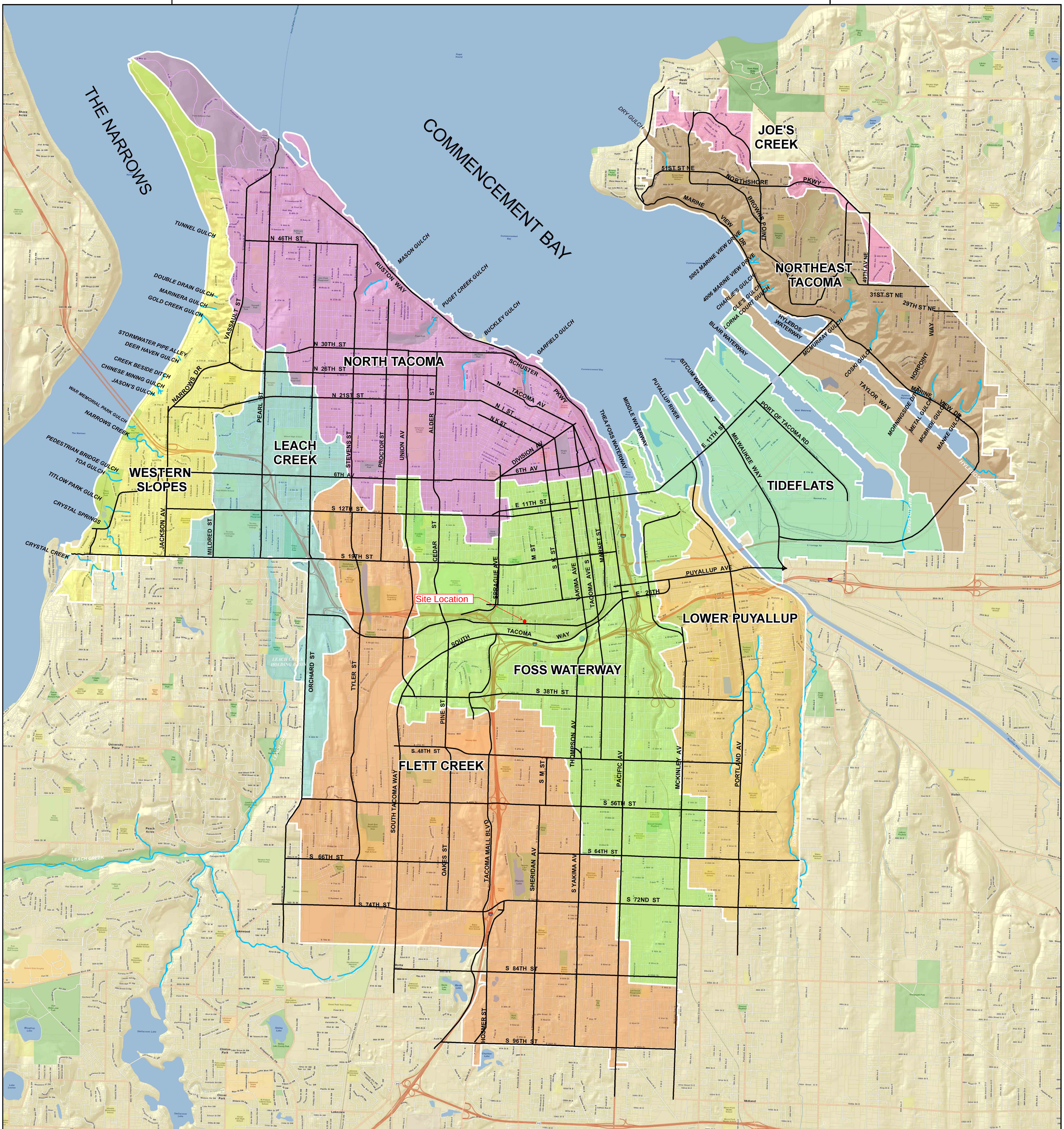
City of Tacoma

CITY OF TACOMA WATERSHEDS

Map Date: August 2010

Source: Environmental Services Division, Public Works Department City of Tacoma

Environmental Services/ Science & Engineering
326 East D Street Tacoma WA 98421
(253) 591-5588



WATERSHEDS

FLETT CREEK	LEACH CREEK	NORTHEAST TACOMA
FOSS WATERWAY	LOWER PUYALLUP	TIDEFLATS
JOE'S CREEK	NORTH TACOMA	WESTERN SLOPES

N

0 0.25 0.5 1 Miles

City of Tacoma 24/7 Sewer Operations
(253) 591-5595
Source Control Pager
(253) 428-2721

G:\gps_datarequest\WATERSHED-08-2011 - Van Pelt

Appendix B – Construction BMPs

- BMP C105: Stabilized Construction Entrance/Exit
- BMP C106: Wheel Wash
- BMP C123: Plastic Covering
- BMP C140: Dust Control
- BMP C150: Materials on Hand
- BMP C160: Certified Erosion and Sediment Control Lead
- BMP C162: Scheduling
- BMP C200: Interceptor Dike and Swale
- BMP C207: Check Dams
- BMP C209: Outlet Protection
- BMP C220: Storm Drain Inlet Protection
- BMP C233: Silt Fence
- Construction Stormwater Filtration (BMP C251)
- Construction Stormwater Chemical Treatment (BMP C 250) (implemented only with prior written approval from Ecology).
- Temporary Runoff Storage Tanks

PRODUCT DATA SHEET

January, 2007

4000 GALLON POLY TANK

(Original Style and Total Drain)

GENERAL INFORMATION

This type of tank is not to be used for food applications. Potable water applications are *generally* not acceptable and must be reviewed by the Corporate office first for approval.

WEIGHTS AND MEASURES

» Capacity:	4000 gallons (nominal)
» Height‡:	10'-9" (to top tangent line) 12'-5" (to top of dome) 12'-10" (to highest point on top lid)
» Diameter:	8'-0" (nominal)
» Weight*:	Tank: 1450 lbs. – 1550 lbs. Pad: 320 lbs.

* Varies with origin of manufacture.
‡ Does not include height of pad. Add four inches for pad thickness to determine heights from grade when pad is used.

DESIGN PARAMETERS

» Tank Material:	High Density Polyethylene
» Design Pressure:	0 psi – vented to atmosphere
» Design Vacuum:	0 psi – vented to atmosphere
» Spec. Gravity Limit:	Original Style – 1.65 Total Drain – 1.9
» Temp. Limit:	150° F
» Certification:	ASTM D1998 (not UL listed)

RESTRICTIONS

» Sulfuric Acid Storage:

- 80% concentration maximum
- Use only tanks with equipment numbers ≥ 4275
- Previously repaired tank cannot be used (equipment number should have "W" at end)
- 100° F maximum temperature
- Top fill only
- Top manway must be open during pneumatic filling of tank
- Use flexible plumbing fixtures resistant to sulfuric acid

FEATURES

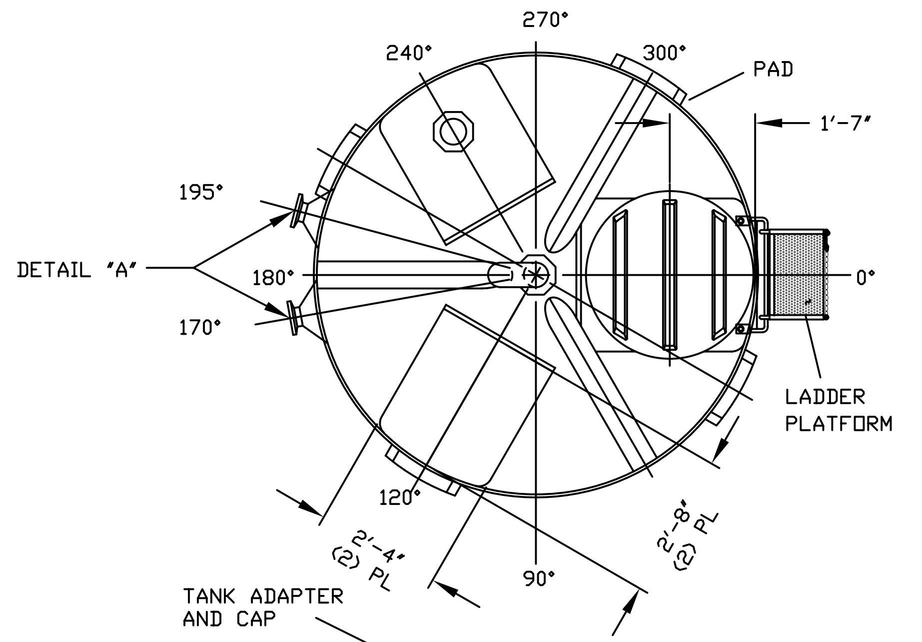
» Top Vent:	2" PVC U-vent (two threaded street elbows)
» Manway:	Top mounted with 24" opening (34" diameter screw-on cover)
» Valves:	3" Spears butterfly valve with PVC body and disc, Viton O-Ring seal and 316 SS stem.
» Ladder:	Top mounted bracket for ladder hook-up. Ladder is not permanently mounted to tank.
» Piping Connections:	Inlet – 3" with butterfly valve Outlet – 3" with butterfly valve Top – 4" PVC adapter and PVC cap

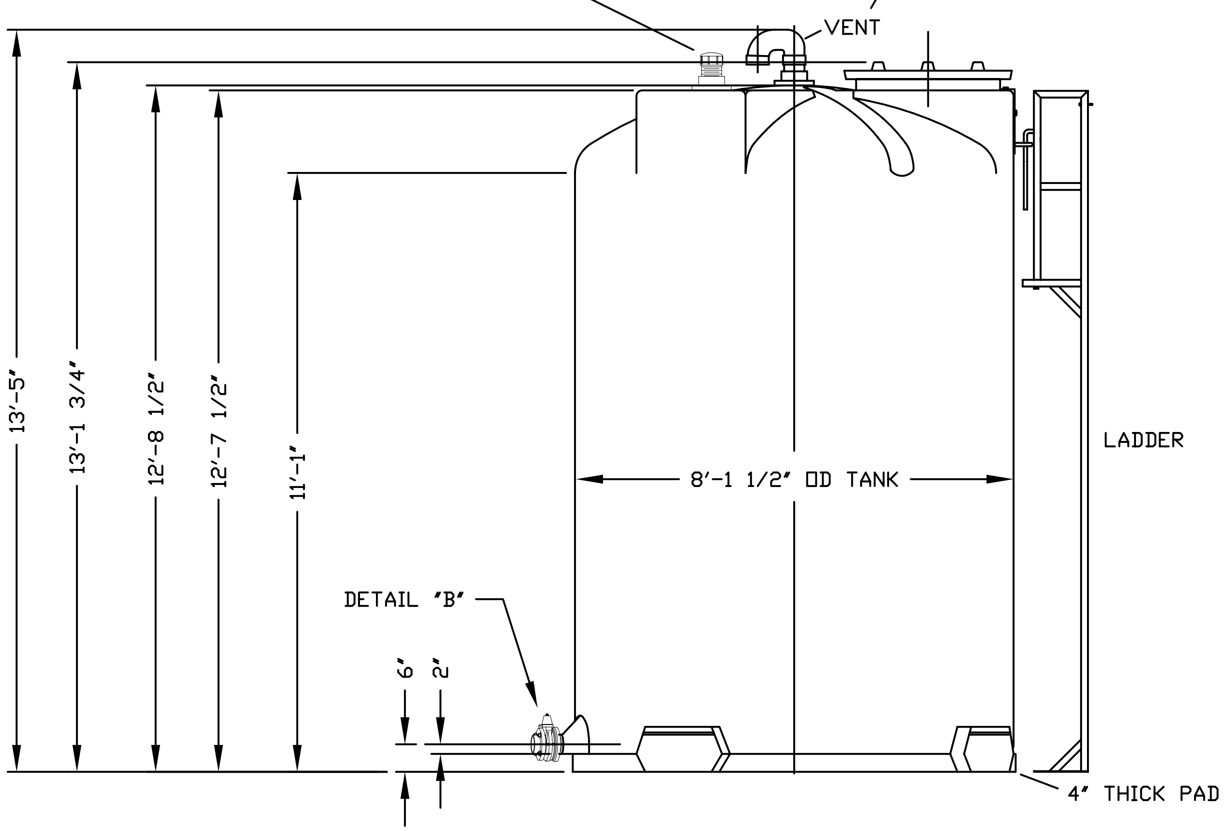
MISCELLANEOUS

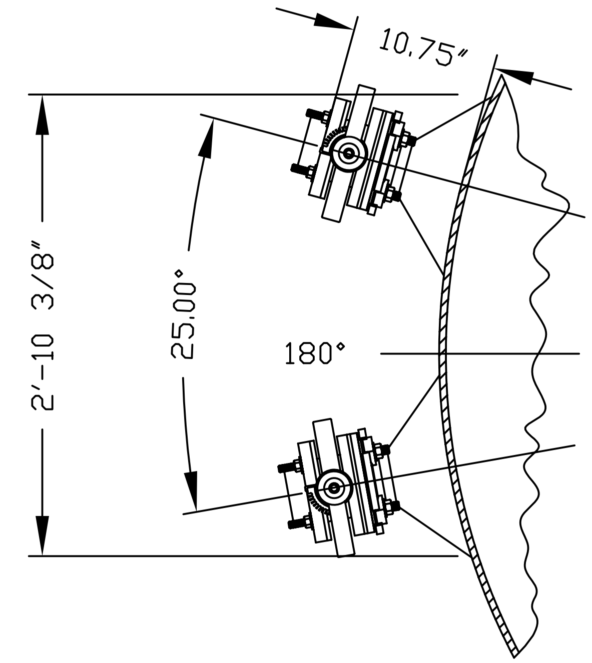
» Options:	Secondary containment berm

BAKERCORP™

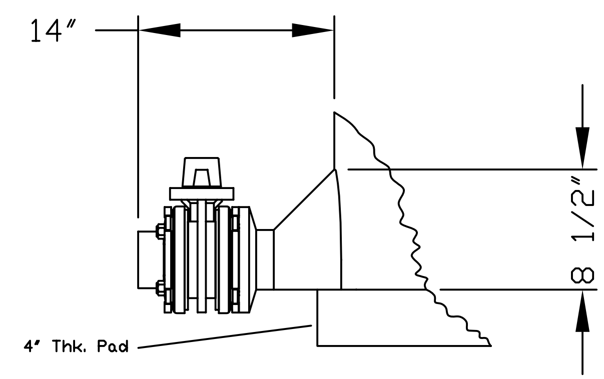
3020 Old Ranch Parkway • Suite 220 • Seal Beach, CA • 562-430-6262







DETAIL "A"
VALVE LAYOUT & CLEARANCE
SCALE: NONE



DETAIL "B"
IMFO (INTEGRALLY MOLDED FLANGED OUTLET)
SCALE: NONE

SULFURIC ACID RESTRICTIONS

1. Do not store sulfuric acid above 80% concentration. For concentrations equal to or less than 80%, use tanks with equipment numbers equal to or greater than P4275. Do not use tanks with lower equipment numbers for sulfuric acid. Concentrations greater than 80% require Corporate approval.
2. Sulfuric acid must be less than 100 degrees to be stored in this tank.
3. Sulfuric acid must be filled through the top of the tank only.
4. Tank vent must always be open when storing sulfuric acid.

NOTES:
1. THIS IS A COMPUTER GENERATED DRAWING. DO NOT REVISE BY HAND.
2. DIMENSIONS WILL VARY ±3% DUE TO VARIATIONS IN MULTIPLE MOLDS & CONDITIONS PREVALENT DURING MANUFACTURE & USAGE.
3. DESIGN TANK WALL THICKNESS FOR 1.9 SpG PRODUCT.
4. SEE DWG 'BK4TUFC', TITLED 'BAKER 4000 GALLON STORAGE TANK TYPICAL FITTING INSTALLATION', FOR FITTING LOCATIONS.

CALIFORNIA VERSION

SPECIFICATIONS:
1) Tank Weight: 1250 lbs.
2) Pad Weight: 300 lbs.
3) Tank Material: HDPE
4) Design Pressure: 0 psig
5) Vacuum Rating: Atmospheric only
6) Temperature limit: 150°F
7) Specific Gravity limit: Original Style - 1.65;
Total Drain - 1.90

NOTES:
1. This drawing is a baseline representation for this model of tank. Variations between this drawing and the actual equipment in the field can and do exist, primarily with appurtenance locations, sizes and quantities. Consult your local BakerCorp representative if specific needs exist.
2. THIS TANK IS *NOT DESIGNED FOR TRANSPORTING LIQUIDS*. It should be moved only when empty..

BAKERCORP
3020 OLD RANCH PARKWAY
SEAL BEACH, CA 90740-2751

REV.	DESCRIPTION	DATE	BY
G			
F			
E			
D			
C			
B	Revised dimensions	10/9/06	PJB
A	Added pad, valves, vent, ladder & bulkhead fitting.	6/5/06	PJB

SCALE: Do Not Scale	SIZE B	ORIGINAL DWG. DATE 05SEP02
DRAWN BY: P.J.B.	APPROVED BY: –	CAT/CLASS ––
TITLE 4000 GALLON POLY TANK TOTAL DRAIN (IMFO)		SHEET 1 OF 1
DRAWING NO. S-3-M0001-1-		REV. B

Appendix C – Alternative BMPs

The following includes a list of possible alternative BMPs for each of the 12 elements not described in the main SWPPP text. This list can be referenced in the event a BMP for a specific element is not functioning as designed and an alternative BMP needs to be implemented.

Element #1 - Mark Clearing Limits

Element #2 - Establish Construction Access

Element #3 - Control Flow Rates

Element #4 - Install Sediment Controls

Advanced BMPs:

Element #5 - Stabilize Soils

Element #6 - Protect Slopes

Element #8 - Stabilize Channels and Outlets

Element #10 - Control Dewatering

Additional Advanced BMPs to Control Dewatering:

BMP C101: Preserving Natural Vegetation

Purpose

The purpose of preserving natural vegetation is to reduce erosion wherever practicable. Limiting site disturbance is the single most effective method for reducing erosion. For example, conifers can hold up to about 50 percent of all rain that falls during a storm. Up to 20-30 percent of this rain may never reach the ground but is taken up by the tree or evaporates. Another benefit is that the rain held in the tree can be released slowly to the ground after the storm.

Conditions of Use

Natural vegetation should be preserved on steep slopes, near perennial and intermittent watercourses or swales, and on building sites in wooded areas.

- As required by local governments.
- Phase construction to preserve natural vegetation on the project site for as long as possible during the construction period.

Design and Installation Specifications

Natural vegetation can be preserved in natural clumps or as individual trees, shrubs and vines.

The preservation of individual plants is more difficult because heavy equipment is generally used to remove unwanted vegetation. The points to remember when attempting to save individual plants are:

- Is the plant worth saving? Consider the location, species, size, age, vigor, and the work involved. Local governments may also have ordinances to save natural vegetation and trees.
- Fence or clearly mark areas around trees that are to be saved. It is preferable to keep ground disturbance away from the trees at least as far out as the dripline.

  Plants need protection from three kinds of injuries:

- *Construction Equipment* - This injury can be above or below the ground level. Damage results from scarring, cutting of roots, and compaction of the soil. Placing a fenced buffer zone around plants to be saved prior to construction can prevent construction equipment injuries.
- *Grade Changes* - Changing the natural ground level will alter grades, which affects the plant's ability to obtain the necessary air, water, and minerals. Minor fills usually do not cause problems although sensitivity between species does vary and should be checked. Trees can typically tolerate fill of 6 inches or less. For shrubs and other plants, the fill should be less.

  When there are major changes in grade, it may become necessary to supply air to the roots of plants. This can be done by placing a layer of gravel and a tile system over the roots before the fill is made. A tile system protects a tree from a raised grade. The tile system should be laid out on the original grade leading from a dry well around the tree trunk. The system should then be covered with small stones to allow air to circulate over the root area.

Lowering the natural ground level can seriously damage trees and shrubs. The highest percentage of the plant roots are in the upper 12 inches of the soil and cuts of only 2-3 inches can cause serious injury. To protect the roots it may be necessary to terrace the immediate area around the plants to be saved. If roots are exposed, construction of retaining walls may be needed to keep the soil in place. Plants can also be preserved by leaving them on an undisturbed, gently sloping mound. To increase the chances for survival, it is best to limit grade changes and other soil disturbances to areas outside the dripline of the plant.

- *Excavations* **-** Protect trees and other plants when excavating for drainfields, power, water, and sewer lines. Where possible, the trenches should be routed around trees and large shrubs. When this is not possible, it is best to tunnel under them. This can be done with hand tools or with power augers. If it is not possible to route the trench around plants to be saved, then the following should be observed:

  Cut as few roots as possible. When you have to cut, cut clean. Paint cut root ends with a wood dressing like asphalt base paint if roots will be exposed for more than 24-hours.

  Backfill the trench as soon as possible.

  Tunnel beneath root systems as close to the center of the main trunk to preserve most of the important feeder roots.

Some problems that can be encountered with a few specific trees are:

- Maple, Dogwood, Red alder, Western hemlock, Western red cedar, and Douglas fir do not readily adjust to changes in environment and special care should be taken to protect these trees.
- The windthrow hazard of Pacific silver fir and madrona is high, while that of Western hemlock is moderate. The danger of windthrow increases where dense stands have been thinned. Other species (unless they are on shallow, wet soils less than 20 inches deep) have a low windthrow hazard.
- Cottonwoods, maples, and willows have water-seeking roots. These can cause trouble in sewer lines and infiltration fields. On the other hand, they thrive in high moisture conditions that other trees would not.
- Thinning operations in pure or mixed stands of Grand fir, Pacific silver fir, Noble fir, Sitka spruce, Western red cedar, Western hemlock, Pacific dogwood, and Red alder can cause serious disease problems. Disease can become established through damaged limbs, trunks, roots,

and freshly cut stumps. Diseased and weakened trees are also susceptible to insect attack.

Maintenance Standards

Inspect flagged and/or fenced areas regularly to make sure flagging or fencing has not been removed or damaged. If the flagging or fencing has been damaged or visibility reduced, it shall be repaired or replaced immediately and visibility restored.

- If tree roots have been exposed or injured, “prune” cleanly with an appropriate pruning saw or lopers directly above the damaged roots and recover with native soils. Treatment of sap flowing trees (fir, hemlock, pine, soft maples) is not advised as sap forms a natural healing barrier.

BMP C102: Buffer Zones

Purpose

Creation of an undisturbed area or strip of natural vegetation or an established suitable planting that will provide a living filter to reduce soil erosion and runoff velocities.

Conditions of Use

Natural buffer zones are used along streams, wetlands and other bodies of water that need protection from erosion and sedimentation. Vegetative buffer zones can be used to protect natural swales and can be incorporated into the natural landscaping of an area.

Critical-areas buffer zones should not be used as sediment treatment areas. These areas shall remain completely undisturbed. The local permitting authority may expand the buffer widths temporarily to allow the use of the expanded area for removal of sediment.

Design and Installation Specifications

- Preserving natural vegetation or plantings in clumps, blocks, or strips is generally the easiest and most successful method.
- Leave all unstable steep slopes in natural vegetation.
- Mark clearing limits and keep all equipment and construction debris out of the natural areas and buffer zones. Steel construction fencing is the most effective method in protecting sensitive areas and buffers. Alternatively, wire-backed silt fence on steel posts is marginally effective. Flagging alone is typically not effective.
- Keep all excavations outside the dripline of trees and shrubs.
- Do not push debris or extra soil into the buffer zone area because it will cause damage from burying and smothering.
- Vegetative buffer zones for streams, lakes or other waterways shall be established by the local permitting authority or other state or federal permits or approvals.

Maintenance Standards

Inspect the area frequently to make sure flagging remains in place and the area remains undisturbed. Replace all damaged flagging immediately.

BMP C103: High Visibility Fence

Purpose

Fencing is intended to:

1. Restrict clearing to approved limits.
2. Prevent disturbance of sensitive areas, their buffers, and other areas required to be left undisturbed.
3. Limit construction traffic to designated construction entrances, exits, or internal roads.
4. Protect areas where marking with survey tape may not provide adequate protection.

Conditions of Use

To establish clearing limits plastic, fabric, or metal fence may be used:

- At the boundary of sensitive areas, their buffers, and other areas required to be left uncleared.
- As necessary to control vehicle access to and on the site.

Design and Installation Specifications

High visibility plastic fence shall be composed of a high-density polyethylene material and shall be at least four feet in height. Posts for the fencing shall be steel or wood and placed every 6 feet on center (maximum) or as needed to ensure rigidity. The fencing shall be fastened to the post every six inches with a polyethylene tie. On long continuous lengths of fencing, a tension wire or rope shall be used as a top stringer to prevent sagging between posts. The fence color shall be high visibility orange. The fence tensile strength shall be 360 lbs./ft. using the ASTM D4595 testing method.

If appropriate install fabric silt fence in accordance with BMP C233 to act as high visibility fence. Silt fence shall be at least 3 feet high and must be highly visible to meet the requirements of this BMP.

Metal fences shall be designed and installed according to the manufacturer's specifications.

Metal fences shall be at least 3 feet high and must be highly visible.

Fences shall not be wired or stapled to trees.

Maintenance Standards

If the fence has been damaged or visibility reduced, it shall be repaired or replaced immediately and visibility restored.

BMP C105: Stabilized Construction Entrance / Exit

Purpose

Stabilized Construction entrances are established to reduce the amount of sediment transported onto paved roads by vehicles or equipment. This is done by constructing a stabilized pad of quarry spalls at entrances and exits for construction sites.

Conditions of Use

Construction entrances shall be stabilized wherever traffic will be entering or leaving a construction site if paved roads or other paved areas are within 1,000 feet of the site.

For residential construction provide stabilized construction entrances for each residence, rather than only at the main subdivision entrance. Stabilized surfaces shall be of sufficient length/width to provide vehicle access/parking, based on lot size/configuration.

On large commercial, highway, and road projects, the designer should include enough extra materials in the contract to allow for additional stabilized entrances not shown in the initial Construction SWPPP. It is difficult to determine exactly where access to these projects will take place; additional materials will enable the contractor to install them where needed.

Design and Installation Specifications

See Figure 4.1.1 for details. Note: the 100' minimum length of the entrance shall be reduced to the maximum practicable size when the size or configuration of the site does not allow the full length (100').

Construct stabilized construction entrances with a 12-inch thick pad of 4-inch to 8-inch quarry spalls, a 4-inch course of asphalt treated base (ATB), or use existing pavement. Do not use crushed concrete, cement, or calcium chloride for construction entrance stabilization because these products raise pH levels in stormwater and concrete discharge to surface waters of the State is prohibited.

A separation geotextile shall be placed under the spalls to prevent fine sediment from pumping up into the rock pad. The geotextile shall meet the following standards:

Grab Tensile Strength (ASTM D4751)	200 psi min.
Grab Tensile Elongation (ASTM D4632)	30% max.
Mullen Burst Strength (ASTM D3786-80a)	400 psi min.
AOS (ASTM D4751)	20-45 (U.S. standard sieve size)

- Consider early installation of the first lift of asphalt in areas that will paved; this can be used as a stabilized entrance. Also consider the installation of excess concrete as a stabilized entrance. During large concrete pours, excess concrete is often available for this purpose.

- Fencing (see BMP C103) shall be installed as necessary to restrict traffic to the construction entrance.
- Whenever possible, the entrance shall be constructed on a firm, compacted subgrade. This can substantially increase the effectiveness of the pad and reduce the need for maintenance.
- Construction entrances should avoid crossing existing sidewalks and back of walk drains if at all possible. If a construction entrance must cross a sidewalk or back of walk drain, the full length of the sidewalk and back of walk drain must be covered and protected from sediment leaving the site.

Maintenance Standards

Quarry spalls shall be added if the pad is no longer in accordance with the specifications.

- If the entrance is not preventing sediment from being tracked onto pavement, then alternative measures to keep the streets free of sediment shall be used. This may include replacement/cleaning of the existing quarry spalls, street sweeping, an increase in the dimensions of the entrance, or the installation of a wheel wash.
- Any sediment that is tracked onto pavement shall be removed by shoveling or street sweeping. The sediment collected by sweeping shall be removed or stabilized on site. The pavement shall not be cleaned by washing down the street, except when high efficiency sweeping is ineffective and there is a threat to public safety. If it is necessary to wash the streets, the construction of a small sump to contain the wash water shall be considered. The sediment would then be washed into the sump where it can be controlled.
- Perform street sweeping by hand or with a high efficiency sweeper. Do not use a non-high efficiency mechanical sweeper because this creates dust and throws soils into storm systems or conveyance ditches.
- Any quarry spalls that are loosened from the pad, which end up on the roadway shall be removed immediately.
- If vehicles are entering or exiting the site at points other than the construction entrance(s), fencing (see BMP C103) shall be installed to control traffic.
- Upon project completion and site stabilization, all construction accesses intended as permanent access for maintenance shall be permanently stabilized.

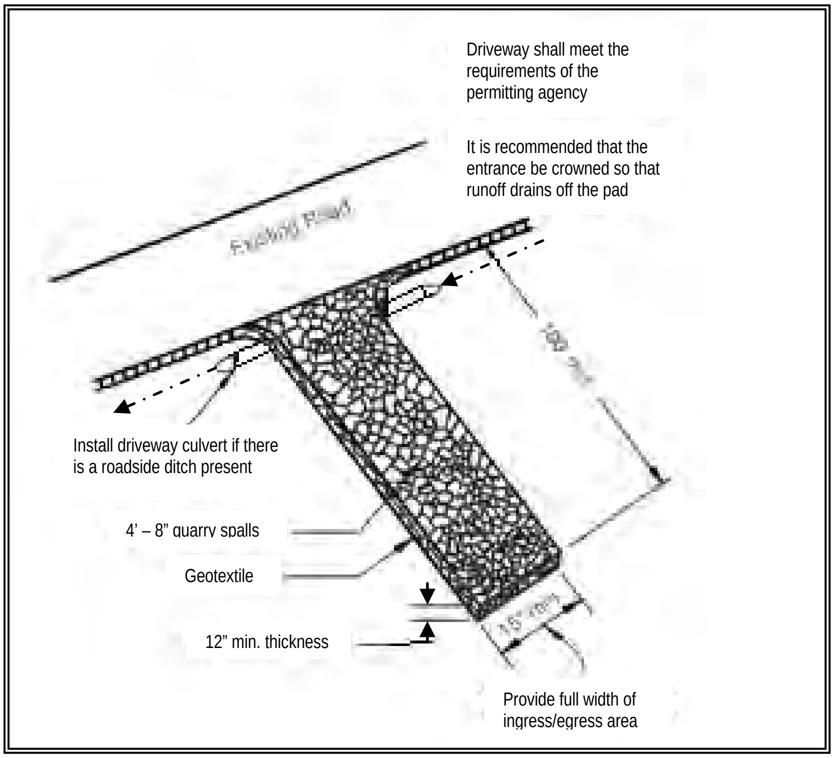


Figure 4.1.1 – Stabilized Construction Entrance

Approved as Equivalent

Ecology has approved products as able to meet the requirements of BMP C105. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept this product approved as equivalent, or may require additional testing prior to consideration for local use. The products are available for review on Ecology's website at http://www.ecy.wa.gov/programs/wq/stormwater/newtech/equivalent.html

BMP C106: Wheel Wash

Purpose

Wheel washes reduce the amount of sediment transported onto paved roads by motor vehicles.

Conditions of Use

When a stabilized construction entrance (see BMP C105) is not preventing sediment from being tracked onto pavement.

- Wheel washing is generally an effective BMP when installed with careful attention to topography. For example, a wheel wash can be detrimental if installed at the top of a slope abutting a right-of-way where the water from the dripping truck can run unimpeded into the street.

- Pressure washing combined with an adequately sized and surfaced pad with direct drainage to a large 10-foot x 10-foot sump can be very effective.
- Discharge wheel wash or tire bath wastewater to a separate on-site treatment system that prevents discharge to surface water, such as closed-loop recirculation or upland land application, or to the sanitary sewer with local sewer district approval.
- Wheel wash or tire bath wastewater should not include wastewater from concrete washout areas.

Design and Installation Specifications

Suggested details are shown in Figure 4.1.2. The Local Permitting Authority may allow other designs. A minimum of 6 inches of asphalt treated base (ATB) over crushed base material or 8 inches over a good subgrade is recommended to pave the wheel wash.

Use a low clearance truck to test the wheel wash before paving. Either a belly dump or lowboy will work well to test clearance.

Keep the water level from 12 to 14 inches deep to avoid damage to truck hubs and filling the truck tongues with water.

Midpoint spray nozzles are only needed in extremely muddy conditions.

Wheel wash systems should be designed with a small grade change, 6- to 1-inches for a 10-foot-wide pond, to allow sediment to flow to the low side of pond to help prevent re-suspension of sediment. A drainpipe with a 2- to 3-foot riser should be installed on the low side of the pond to allow for easy cleaning and refilling. Polymers may be used to promote coagulation and flocculation in a closed-loop system. Polyacrylamide (PAM) added to the wheel wash water at a rate of 0.25 - 0.5 pounds per 1,000 gallons of water increases effectiveness and reduces cleanup time. If PAM is already being used for dust or erosion control and is being applied by a water truck, the same truck can be used to change the wash water.

Maintenance Standards

The wheel wash should start out the day with fresh water.

The wash water should be changed a minimum of once per day. On large earthwork jobs where more than 10-20 trucks per hour are expected, the wash water will need to be changed more often.

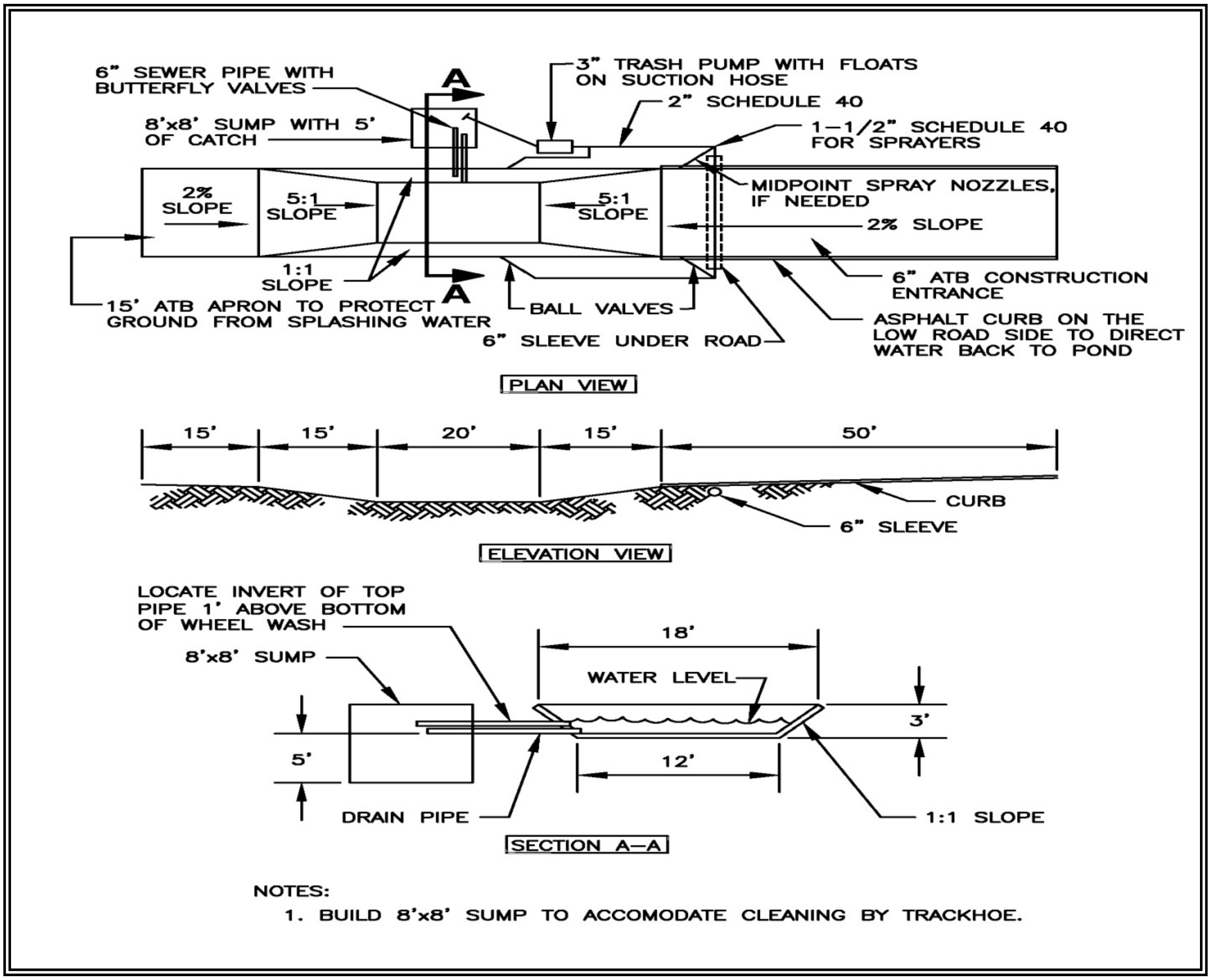


Figure 4.1.2 – Wheel Wash

Notes:

1. Asphalt construction entrance 6 in. asphalt treated base (ATB).
2. 3-inch trash pump with floats on the suction hose.
3. Midpoint spray nozzles, if needed.
4. 6-inch sewer pipe with butterfly valves. Bottom one is a drain. Locate top pipe's invert 1 foot above bottom of wheel wash.
5. 8 foot x 8 foot sump with 5 feet of catch. Build so the sump can be cleaned with a trackhoe.
6. Asphalt curb on the low road side to direct water back to pond.
7. 6-inch sleeve under road.
8. Ball valves.
9. 15 foot. ATB apron to protect ground from splashing water.

BMP C107: Construction Road/Parking Area Stabilization

Purpose Stabilizing subdivision roads, parking areas, and other on-site vehicle transportation routes immediately after grading reduces erosion caused by construction traffic or runoff.

Conditions of Use Roads or parking areas shall be stabilized wherever they are constructed, whether permanent or temporary, for use by construction traffic.

- High Visibility Fencing (see BMP C103) shall be installed, if necessary, to limit the access of vehicles to only those roads and parking areas that are stabilized.

Design and Installation Specifications

- On areas that will receive asphalt as part of the project, install the first lift as soon as possible.
- A 6-inch depth of 2- to 4-inch crushed rock, gravel base, or crushed surfacing base course shall be applied immediately after grading or utility installation. A 4-inch course of asphalt treated base (ATB) may also be used, or the road/parking area may be paved. It may also be possible to use cement or calcium chloride for soil stabilization. If cement or cement kiln dust is used for roadbase stabilization, pH monitoring and BMPs (BMPs C252 and C253) are necessary to evaluate and minimize the effects on stormwater. If the area will not be used for permanent roads, parking areas, or structures, a 6-inch depth of hog fuel may also be used, but this is likely to require more maintenance. Whenever possible, construction roads and parking areas shall be placed on a firm, compacted subgrade.
- Temporary road gradients shall not exceed 15 percent. Roadways shall be carefully graded to drain. Drainage ditches shall be provided on each side of the roadway in the case of a crowned section, or on one side in the case of a super-elevated section. Drainage ditches shall be directed to a sediment control BMP.
- Rather than relying on ditches, it may also be possible to grade the road so that runoff sheet-flows into a heavily vegetated area with a well-developed topsoil. Landscaped areas are not adequate. If this area has at least 50 feet of vegetation that water can flow through, then it is generally preferable to use the vegetation to treat runoff, rather than a sediment pond or trap. The 50 feet shall not include wetlands or their buffers. If runoff is allowed to sheetflow through adjacent vegetated areas, it is vital to design the roadways and parking areas so that no concentrated runoff is created.
- Storm drain inlets shall be protected to prevent sediment-laden water entering the storm drain system (see BMP C220).

Maintenance Standards Inspect stabilized areas regularly, especially after large storm events.

Crushed rock, gravel base, etc. shall be added as required to maintain a stable driving surface and to stabilize any areas that have eroded.

Following construction, these areas shall be restored to pre-construction condition or better to prevent future erosion.

Perform street cleaning at the end of each day or more often if necessary.

BMP C120: Temporary and Permanent Seeding

Purpose

Seeding reduces erosion by stabilizing exposed soils. A well-established vegetative cover is one of the most effective methods of reducing erosion.

Conditions of Use

Use seeding throughout the project on disturbed areas that have reached final grade or that will remain unworked for more than 30 days.

The optimum seeding windows for western Washington are April 1 through June 30 and September 1 through October 1.

Between July 1 and August 30 seeding requires irrigation until 75 percent grass cover is established.

Between October 1 and March 30 seeding requires a cover of mulch with straw or an erosion control blanket until 75 percent grass cover is established.

Review all disturbed areas in late August to early September and complete all seeding by the end of September. Otherwise, vegetation will not establish itself enough to provide more than average protection.

- Mulch is required at all times for seeding because it protects seeds from heat, moisture loss, and transport due to runoff. Mulch can be applied on top of the seed or simultaneously by hydroseeding. See BMP C121: Mulching for specifications.
- Seed and mulch, all disturbed areas not otherwise vegetated at final site stabilization. Final stabilization means the completion of all soil disturbing activities at the site and the establishment of a permanent vegetative cover, or equivalent permanent stabilization measures (such as pavement, riprap, gabions or geotextiles) which will prevent erosion.

Design and Installation Specifications

Seed retention/detention ponds as required.

Install channels intended for vegetation before starting major earthwork and hydroseed with a Bonded Fiber Matrix. For vegetated channels that will have high flows, install erosion control blankets over hydroseed. Before allowing water to flow in vegetated channels, establish 75 percent vegetation cover. If vegetated channels cannot be established by seed before water flow; install sod in the channel bottom—over hydromulch and erosion control blankets.

- Confirm the installation of all required surface water control measures to prevent seed from washing away.
- Hydroseed applications shall include a minimum of 1,500 pounds per acre of mulch with 3 percent tackifier. See BMP C121: Mulching for specifications.
- Areas that will have seeding only and not landscaping may need compost or meal-based mulch included in the hydroseed in order to establish vegetation. Re-install native topsoil on the disturbed soil surface before application.
- When installing seed via hydroseeding operations, only about 1/3 of the seed actually ends up in contact with the soil surface. This reduces the ability to establish a good stand of grass quickly. To overcome this, consider increasing seed quantities by up to 50 percent.
- Enhance vegetation establishment by dividing the hydromulch operation into two phases:

  1. Phase 1- Install all seed and fertilizer with 25-30 percent mulch and tackifier onto soil in the first lift.
  2. Phase 2- Install the rest of the mulch and tackifier over the first lift.

  Or, enhance vegetation by:

  1. Installing the mulch, seed, fertilizer, and tackifier in one lift.
  2. Spread or blow straw over the top of the hydromulch at a rate of 800-1000 pounds per acre.
  3. Hold straw in place with a standard tackifier.

  Both of these approaches will increase cost moderately but will greatly improve and enhance vegetative establishment. The increased cost may be offset by the reduced need for:

  - Irrigation.
  - Reapplication of mulch.
  - Repair of failed slope surfaces.

  This technique works with standard hydromulch (1,500 pounds per acre minimum) and BFM/MBFMs (3,000 pounds per acre minimum).
- Seed may be installed by hand if:
  - Temporary and covered by straw, mulch, or topsoil.
  - Permanent in small areas (usually less than 1 acre) and covered with mulch, topsoil, or erosion blankets.
- The seed mixes listed in the tables below include recommended mixes for both temporary and permanent seeding.

- Apply these mixes, with the exception of the wetland mix, at a rate of 120 pounds per acre. This rate can be reduced if soil amendments or slow-release fertilizers are used.
- Consult the local suppliers or the local conservation district for their recommendations because the appropriate mix depends on a variety of factors, including location, exposure, soil type, slope, and expected foot traffic. Alternative seed mixes approved by the local authority may be used.
- Other mixes may be appropriate, depending on the soil type and hydrology of the area.

- Table 4.1.2 lists the standard mix for areas requiring a temporary vegetative cover.

Table 4.1.2
Temporary Erosion Control Seed Mix

	% Weight	% Purity	% Germination
Chewings or annual blue grass *Festuca rubra var. commutata* or *Poa anna*	40	98	90
Perennial rye - *Lolium perenne*	50	98	90
Redtop or colonial bentgrass *Agrostis alba* or *Agrostis tenuis*	5	92	85
White dutch clover *Trifolium repens*	5	98	90

- Table 4.1.3 lists a recommended mix for landscaping seed.

Table 4.1.3
Landscaping Seed Mix

	% Weight	% Purity	% Germination
Perennial rye blend *Lolium perenne*	70	98	90
Chewings and red fescue blend *Festuca rubra var. commutata* or *Festuca rubra*	30	98	90

- Table 4.1.4 lists a turf seed mix for dry situations where there is no need for watering. This mix requires very little maintenance.

Table 4.1.4
Low-Growing Turf Seed Mix

	% Weight	% Purity	% Germination
Dwarf tall fescue (several varieties) *Festuca arundinacea var.*	45	98	90
Dwarf perennial rye (Barclay) *Lolium perenne var. barclay*	30	98	90
Red fescue *Festuca rubra*	20	98	90
Colonial bentgrass *Agrostis tenuis*	5	98	90

- Table 4.1.5 lists a mix for bioswales and other intermittently wet areas.

Table 4.1.5
Bioswale Seed Mix*

	% Weight	% Purity	% Germination
Tall or meadow fescue *Festuca arundinacea* or *Festuca elatior*	75-80	98	90
Seaside/Creeping bentgrass *Agrostis palustris*	10-15	92	85
Redtop bentgrass *Agrostis alba* or *Agrostis gigantea*	5-10	90	80

* *Modified Briargreen, Inc. Hydroseeding Guide Wetlands Seed Mix*

- Table 4.1.6 lists a low-growing, relatively non-invasive seed mix appropriate for very wet areas that are not regulated wetlands. Apply this mixture at a rate of 60 pounds per acre. Consult Hydraulic Permit Authority (HPA) for seed mixes if applicable.

Table 4.1.6
Wet Area Seed Mix*

	% Weight	% Purity	% Germination
Tall or meadow fescue *Festuca arundinacea* or *Festuca elatior*	60-70	98	90
Seaside/Creeping bentgrass *Agrostis palustris*	10-15	98	85
Meadow foxtail *Alepocurus pratensis*	10-15	90	80
Alsike clover *Trifolium hybridum*	1-6	98	90
Redtop bentgrass *Agrostis alba*	1-6	92	85

** Modified Briargreen, Inc. Hydroseeding Guide Wetlands Seed Mix*

- Table 4.1.7 lists a recommended meadow seed mix for infrequently maintained areas or non-maintained areas where colonization by native plants is desirable. Likely applications include rural road and utility right-of-way. Seeding should take place in September or very early October in order to obtain adequate establishment prior to the winter months. Consider the appropriateness of clover, a fairly invasive species, in the mix. Amending the soil can reduce the need for clover.

Table 4.1.7
Meadow Seed Mix

	% Weight	% Purity	% Germination
Redtop or Oregon bentgrass *Agrostis alba* or *Agrostis oregonensis*	20	92	85
Red fescue *Festuca rubra*	70	98	90
White dutch clover *Trifolium repens*	10	98	90

- **Roughening and Rototilling:**
  - The seedbed should be firm and rough. Roughen all soil no matter what the slope. Track walk slopes before seeding if engineering purposes require compaction. Backblading or smoothing of slopes greater than 4H:1V is not allowed if they are to be seeded.
  - Restoration-based landscape practices require deeper incorporation than that provided by a simple single-pass rototilling treatment. Wherever practical, initially rip the subgrade to improve long-term permeability, infiltration, and water inflow qualities. At a minimum, permanent areas shall use soil amendments to achieve organic matter and permeability performance defined in engineered soil/landscape systems. For systems that are deeper than 8 inches complete the rototilling process in multiple lifts, or prepare the engineered soil system per specifications and place to achieve the specified depth.
- **Fertilizers:**
  - Conducting soil tests to determine the exact type and quantity of fertilizer is recommended. This will prevent the over-application of fertilizer.
  - Organic matter is the most appropriate form of fertilizer because it provides nutrients (including nitrogen, phosphorus, and potassium) in the least water-soluble form.
  - In general, use 10-4-6 N-P-K (nitrogen-phosphorus-potassium) fertilizer at a rate of 90 pounds per acre. Always use slow-release fertilizers because they are more efficient and have fewer environmental impacts. Do not add fertilizer to the hydromulch machine, or agitate, more than 20 minutes before use. Too much agitation destroys the slow-release coating.
  - There are numerous products available that take the place of chemical fertilizers. These include several with seaweed extracts that are beneficial to soil microbes and organisms. If 100 percent cottonseed meal is used as the mulch in hydroseed, chemical fertilizer may not be necessary. Cottonseed meal provides a good source of long-term, slow-release, available nitrogen.
- **Bonded Fiber Matrix and Mechanically Bonded Fiber Matrix:**
  - On steep slopes use Bonded Fiber Matrix (BFM) or Mechanically Bonded Fiber Matrix (MBFM) products. Apply BFM/MBFM products at a minimum rate of 3,000 pounds per acre of mulch with approximately 10 percent tackifier. Achieve a minimum of 95 percent soil coverage during application. Numerous products are available commercially. Installed products per manufacturer's instructions. Most products require 24-36 hours to cure before rainfall and cannot be installed on wet or saturated soils.

Generally, products come in 40-50 pound bags and include all necessary ingredients except for seed and fertilizer.

- BFMs and MBFMs provide good alternatives to blankets in most areas requiring vegetation establishment. Advantages over blankets include:
  - BFM and MBFMs do not require surface preparation.
  - Helicopters can assist in installing BFM and MBFMs in remote areas.
  - On slopes steeper than 2.5H:1V, blanket installers may require ropes and harnesses for safety.
  - Installing BFM and MBFMs can save at least $1,000 per acre compared to blankets.

Maintenance Standards

Reseed any seeded areas that fail to establish at least 80 percent cover (100 percent cover for areas that receive sheet or concentrated flows). If reseeding is ineffective, use an alternate method such as sodding, mulching, or nets/blankets. If winter weather prevents adequate grass growth, this time limit may be relaxed at the discretion of the local authority when sensitive areas would otherwise be protected.

- Reseed and protect by mulch any areas that experience erosion after achieving adequate cover. Reseed and protect by mulch any eroded area.
- Supply seeded areas with adequate moisture, but do not water to the extent that it causes runoff.

Approved as Equivalent

Ecology has approved products as able to meet the requirements of BMP C120. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept this product approved as equivalent, or may require additional testing prior to consideration for local use. The products are available for review on Ecology's website at http://www.ecy.wa.gov/programs/wq/stormwater/newtech/equivalent.html

BMP C121: Mulching

Purpose

Mulching soils provides immediate temporary protection from erosion. Mulch also enhances plant establishment by conserving moisture, holding fertilizer, seed, and topsoil in place, and moderating soil temperatures. There is an enormous variety of mulches that can be used. This section discusses only the most common types of mulch.

Conditions of Use

As a temporary cover measure, mulch should be used:

- For less than 30 days on disturbed areas that require cover.
- At all times for seeded areas, especially during the wet season and

BMP C123: Plastic Covering

Purpose

Plastic covering provides immediate, short-term erosion protection to slopes and disturbed areas.

Conditions of Use

Plastic covering may be used on disturbed areas that require cover measures for less than 30 days, except as stated below.

- Plastic is particularly useful for protecting cut and fill slopes and stockpiles. Note: The relatively rapid breakdown of most polyethylene sheeting makes it unsuitable for long-term (greater than six months) applications.
- Due to rapid runoff caused by plastic covering, do not use this method upslope of areas that might be adversely impacted by concentrated runoff. Such areas include steep and/or unstable slopes.
- Plastic sheeting may result in increased runoff volumes and velocities, requiring additional on-site measures to counteract the increases. Creating a trough with wattles or other material can convey clean water away from these areas.
- To prevent undercutting, trench and backfill rolled plastic covering products.
- While plastic is inexpensive to purchase, the added cost of installation, maintenance, removal, and disposal make this an expensive material, up to $1.50-2.00 per square yard.
- Whenever plastic is used to protect slopes install water collection measures at the base of the slope. These measures include plastic-covered berms, channels, and pipes used to covey clean rainwater away from bare soil and disturbed areas. Do not mix clean runoff from a plastic covered slope with dirty runoff from a project.
- Other uses for plastic include:
  1. Temporary ditch liner.
  2. Pond liner in temporary sediment pond.
  3. Liner for bermed temporary fuel storage area if plastic is not reactive to the type of fuel being stored.
  4. Emergency slope protection during heavy rains.
  5. Temporary drainpipe (“elephant trunk”) used to direct water.

Design and Installation Specifications

- Plastic slope cover must be installed as follows:
  1. Run plastic up and down slope, not across slope.
  2. Plastic may be installed perpendicular to a slope if the slope length is less than 10 feet.
  3. Minimum of 8-inch overlap at seams.

4. On long or wide slopes, or slopes subject to wind, tape all seams.
5. Place plastic into a small (12-inch wide by 6-inch deep) slot trench at the top of the slope and backfill with soil to keep water from flowing underneath.
6. Place sand filled burlap or geotextile bags every 3 to 6 feet along seams and tie them together with twine to hold them in place.
7. Inspect plastic for rips, tears, and open seams regularly and repair immediately. This prevents high velocity runoff from contacting bare soil which causes extreme erosion.
8. Sandbags may be lowered into place tied to ropes. However, all sandbags must be staked in place.

- Plastic sheeting shall have a minimum thickness of 0.06 millimeters.
- If erosion at the toe of a slope is likely, a gravel berm, riprap, or other suitable protection shall be installed at the toe of the slope in order to reduce the velocity of runoff.

Maintenance Standards

- Torn sheets must be replaced and open seams repaired.
- Completely remove and replace the plastic if it begins to deteriorate due to ultraviolet radiation.
- Completely remove plastic when no longer needed.
- Dispose of old tires used to weight down plastic sheeting appropriately.

Approved as Equivalent

Ecology has approved products as able to meet the requirements of BMP C123. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept this product approved as equivalent, or may require additional testing prior to consideration for local use. The products are available for review on Ecology's website at http://www.ecy.wa.gov/programs/wq/stormwater/newtech/equivalent.html

BMP C124: Sodding

Purpose

The purpose of sodding is to establish permanent turf for immediate erosion protection and to stabilize drainage ways where concentrated overland flow will occur.

Conditions of Use

Sodding may be used in the following areas:

- Disturbed areas that require short-term or long-term cover.
- Disturbed areas that require immediate vegetative cover.
- All waterways that require vegetative lining. Waterways may also be seeded rather than sodded, and protected with a net or blanket.

Design and Installation Specifications

Sod shall be free of weeds, of uniform thickness (approximately 1-inch thick), and shall have a dense root mat for mechanical strength.

The following steps are recommended for sod installation:

- Shape and smooth the surface to final grade in accordance with the approved grading plan. The swale needs to be overexcavated 4 to 6 inches below design elevation to allow room for placing soil amendment and sod.
- Amend 4 inches (minimum) of compost into the top 8 inches of the soil if the organic content of the soil is less than ten percent or the permeability is less than 0.6 inches per hour. See http://www.ecy.wa.gov/programs/swfa/organics/soil.html for further information.
- Fertilize according to the supplier's recommendations.
- Work lime and fertilizer 1 to 2 inches into the soil, and smooth the surface.
- Lay strips of sod beginning at the lowest area to be sodded and perpendicular to the direction of water flow. Wedge strips securely into place. Square the ends of each strip to provide for a close, tight fit. Stagger joints at least 12 inches. Staple on slopes steeper than 3H:1V. Staple the upstream edge of each sod strip.
- Roll the sodded area and irrigate.
- When sodding is carried out in alternating strips or other patterns, seed the areas between the sod immediately after sodding.

Maintenance Standards

If the grass is unhealthy, the cause shall be determined and appropriate action taken to reestablish a healthy groundcover. If it is impossible to establish a healthy groundcover due to frequent saturation, instability, or some other cause, the sod shall be removed, the area seeded with an appropriate mix, and protected with a net or blanket.

BMP C125: Topsoiling / Composting

Purpose

Topsoiling and composting provide a suitable growth medium for final site stabilization with vegetation. While not a permanent cover practice in itself, topsoiling and composting are an integral component of providing permanent cover in those areas where there is an unsuitable soil surface for plant growth. Use this BMP in conjunction with other BMPs such as seeding, mulching, or sodding.

Native soils and disturbed soils that have been organically amended not only retain much more stormwater, but they also serve as effective biofilters for urban pollutants and, by supporting more vigorous plant growth, reduce the water, fertilizer and pesticides needed to support

BMP C140: Dust Control

Purpose

Dust control prevents wind transport of dust from disturbed soil surfaces onto roadways, drainage ways, and surface waters.

Conditions of Use

- In areas (including roadways) subject to surface and air movement of dust where on-site and off-site impacts to roadways, drainage ways, or surface waters are likely.

Design and Installation Specifications

- Vegetate or mulch areas that will not receive vehicle traffic. In areas where planting, mulching, or paving is impractical, apply gravel or landscaping rock.
- Limit dust generation by clearing only those areas where immediate activity will take place, leaving the remaining area(s) in the original condition. Maintain the original ground cover as long as practical.
- Construct natural or artificial windbreaks or windscreens. These may be designed as enclosures for small dust sources.
- Sprinkle the site with water until surface is wet. Repeat as needed. To prevent carryout of mud onto street, refer to Stabilized Construction Entrance (BMP C105).
- Irrigation water can be used for dust control. Irrigation systems should be installed as a first step on sites where dust control is a concern.
- Spray exposed soil areas with a dust palliative, following the manufacturer's instructions and cautions regarding handling and application. Used oil is prohibited from use as a dust suppressant. Local governments may approve other dust palliatives such as calcium chloride or PAM.
- PAM (BMP C126) added to water at a rate of 0.5 lbs. per 1,000 gallons of water per acre and applied from a water truck is more effective than water alone. This is due to increased infiltration of water into the soil and reduced evaporation. In addition, small soil particles are bonded together and are not as easily transported by wind. Adding PAM may actually reduce the quantity of water needed for dust control. Use of PAM could be a cost-effective dust control method.

Techniques that can be used for unpaved roads and lots include:

- Lower speed limits. High vehicle speed increases the amount of dust stirred up from unpaved roads and lots.
- Upgrade the road surface strength by improving particle size, shape, and mineral types that make up the surface and base materials.
- Add surface gravel to reduce the source of dust emission. Limit the amount of fine particles (those smaller than .075 mm) to 10 to 20 percent.

- Use geotextile fabrics to increase the strength of new roads or roads undergoing reconstruction.
- Encourage the use of alternate, paved routes, if available.
- Restrict use of paved roadways by tracked vehicles and heavy trucks to prevent damage to road surface and base.
- Apply chemical dust suppressants using the admix method, blending the product with the top few inches of surface material. Suppressants may also be applied as surface treatments.
- Pave unpaved permanent roads and other trafficked areas.
- Use vacuum street sweepers.
- Remove mud and other dirt promptly so it does not dry and then turn into dust.
- Limit dust-causing work on windy days.
- Contact your local Air Pollution Control Authority for guidance and training on other dust control measures. Compliance with the local Air Pollution Control Authority constitutes compliance with this BMP.

Maintenance Standards

Respray area as necessary to keep dust to a minimum.

BMP C150: Materials on Hand

Purpose

Keep quantities of erosion prevention and sediment control materials on the project site at all times to be used for regular maintenance and emergency situations such as unexpected heavy summer rains. Having these materials on-site reduces the time needed to implement BMPs when inspections indicate that existing BMPs are not meeting the Construction SWPPP requirements. In addition, contractors can save money by buying some materials in bulk and storing them at their office or yard.

Conditions of Use

- Construction projects of any size or type can benefit from having materials on hand. A small commercial development project could have a roll of plastic and some gravel available for immediate protection of bare soil and temporary berm construction. A large earthwork project, such as highway construction, might have several tons of straw, several rolls of plastic, flexible pipe, sandbags, geotextile fabric and steel "T" posts.
- Materials are stockpiled and readily available before any site clearing, grubbing, or earthwork begins. A large contractor or developer could keep a stockpile of materials that are available for use on several projects.
- If storage space at the project site is at a premium, the contractor could maintain the materials at their office or yard. The office or yard must be less than an hour from the project site.

Design and Installation Specifications

Depending on project type, size, complexity, and length, materials and quantities will vary. A good minimum list of items that will cover numerous situations includes:

Material
Clear Plastic, 6 mil
Drainpipe, 6 or 8 inch diameter
Sandbags, filled
Straw Bales for mulching,
Quarry Spalls
Washed Gravel
Geotextile Fabric
Catch Basin Inserts
Steel "T" Posts
Silt fence material
Straw Wattles

Maintenance Standards

- All materials with the exception of the quarry spalls, steel "T" posts, and gravel should be kept covered and out of both sun and rain.
- Re-stock materials used as needed.

BMP C151: Concrete Handling

Purpose

Concrete work can generate process water and slurry that contain fine particles and high pH, both of which can violate water quality standards in the receiving water. Concrete spillage or concrete discharge to surface waters of the State is prohibited. Use this BMP to minimize and eliminate concrete, concrete process water, and concrete slurry from entering waters of the state.

Conditions of Use

Any time concrete is used, utilize these management practices. Concrete construction projects include, but are not limited to, the following:

- Curbs
- Sidewalks
- Roads
- Bridges
- Foundations
- Floors
- Runways

Design and Installation

- Wash out concrete truck chutes, pumps, and internals into formed areas only. Assure that washout of concrete trucks is performed off-

Specifications

site or in designated concrete washout areas. Do not wash out concrete trucks onto the ground, or into storm drains, open ditches, streets, or streams. Refer to BMP C154 for information on concrete washout areas.

- Return unused concrete remaining in the truck and pump to the originating batch plant for recycling. Do not dump excess concrete on site, except in designated concrete washout areas.
- Wash off hand tools including, but not limited to, screeds, shovels, rakes, floats, and trowels into formed areas only.
- Wash equipment difficult to move, such as concrete pavers in areas that do not directly drain to natural or constructed stormwater conveyances.
- Do not allow washdown from areas, such as concrete aggregate driveways, to drain directly to natural or constructed stormwater conveyances.
- Contain washwater and leftover product in a lined container when no formed areas are available,. Dispose of contained concrete in a manner that does not violate ground water or surface water quality standards.
- Always use forms or solid barriers for concrete pours, such as pilings, within 15-feet of surface waters.
- Refer to BMPs C252 and C253 for pH adjustment requirements.
- Refer to the Construction Stormwater General Permit for pH monitoring requirements if the project involves one of the following activities:
    - Significant concrete work (greater than 1,000 cubic yards poured concrete or recycled concrete used over the life of a project).
    - The use of engineered soils amended with (but not limited to) Portland cement-treated base, cement kiln dust or fly ash.
    - Discharging stormwater to segments of water bodies on the 303(d) list (Category 5) for high pH.

Maintenance Standards

Check containers for holes in the liner daily during concrete pours and repair the same day.

BMP C160: Certified Erosion and Sediment Control Lead

Purpose

The project proponent designates at least one person as the responsible representative in charge of erosion and sediment control (ESC), and water quality protection. The designated person shall be the Certified Erosion and Sediment Control Lead (CESCL) who is responsible for ensuring compliance with all local, state, and federal erosion and sediment control and water quality requirements.

Conditions of Use

A CESCL shall be made available on projects one acre or larger that discharge stormwater to surface waters of the state. Sites less than one acre may have a person without CESCL certification conduct inspections; sampling is not required on sites that disturb less than an acre.

- The CESCL shall:
    - Have a current certificate proving attendance in an erosion and sediment control training course that meets the minimum ESC training and certification requirements established by Ecology (see details below).

      Ecology will maintain a list of ESC training and certification providers at: http://www.ecy.wa.gov/programs/wq/stormwater/cescl.html

      OR

    - Be a Certified Professional in Erosion and Sediment Control (CPESC); for additional information go to: www.cpesc.net

Specifications

- Certification shall remain valid for three years.
- The CESCL shall have authority to act on behalf of the contractor or developer and shall be available, or on-call, 24 hours per day throughout the period of construction.
- The Construction SWPPP shall include the name, telephone number, fax number, and address of the designated CESCL.
- A CESCL may provide inspection and compliance services for multiple construction projects in the same geographic region.

Duties and responsibilities of the CESCL shall include, but are not limited to the following:

- Maintaining permit file on site at all times which includes the Construction SWPPP and any associated permits and plans.
- Directing BMP installation, inspection, maintenance, modification, and removal.

- Updating all project drawings and the Construction SWPPP with changes made.
- Completing any sampling requirements including reporting results using WebDMR.
- Keeping daily logs, and inspection reports. Inspection reports should include:
  - Inspection date/time.
  - Weather information; general conditions during inspection and approximate amount of precipitation since the last inspection.
  - A summary or list of all BMPs implemented, including observations of all erosion/sediment control structures or practices. The following shall be noted:
    1. Locations of BMPs inspected.
    2. Locations of BMPs that need maintenance.
    3. Locations of BMPs that failed to operate as designed or intended.
    4. Locations of where additional or different BMPs are required.
    - Visual monitoring results, including a description of discharged stormwater. The presence of suspended sediment, turbid water, discoloration, and oil sheen shall be noted, as applicable.
    - Any water quality monitoring performed during inspection.
    - General comments and notes, including a brief description of any BMP repairs, maintenance or installations made as a result of the inspection.
- Facilitate, participate in, and take corrective actions resulting from inspections performed by outside agencies or the owner.

BMP C162: Scheduling

Purpose Sequencing a construction project reduces the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking.

Conditions of Use The construction sequence schedule is an orderly listing of all major land-disturbing activities together with the necessary erosion and sedimentation control measures planned for the project. This type of schedule guides the contractor on work to be done before other work is started so that serious erosion and sedimentation problems can be avoided.

Following a specified work schedule that coordinates the timing of land-disturbing activities and the installation of control measures is perhaps the most cost-effective way of controlling erosion during construction. The removal of surface ground cover leaves a site vulnerable to accelerated erosion. Construction procedures that limit land clearing provide timely installation of erosion and sedimentation controls, and restore protective cover quickly can significantly reduce the erosion potential of a site.

Design Considerations

- Minimize construction during rainy periods.
- Schedule projects to disturb only small portions of the site at any one time. Complete grading as soon as possible. Immediately stabilize the disturbed portion before grading the next portion. Practice staged seeding in order to revegetate cut and fill slopes as the work progresses.

4.2 Runoff Conveyance and Treatment BMPs

This section contains the standards and specifications for Runoff Conveyance and Treatment BMPs. Table 4.2.1, below, shows the relationship of the BMPs in Section 4.2 to the Construction Stormwater Pollution Prevention Plan (SWPPP) Elements described in Section 3.3.3.

Table 4.2.1 Runoff Conveyance and Treatment BMPs by SWPPP Element

BMP or Element Name	Element #1 Preserve Vegetation/Mark Clearing Limits	Element #2 Establish Construction Access	Element #5 Stabilize Soils	Element #6 Protect Slopes	Element #8 Stabilize Channels and Outlets	Element #9 Control Pollutants	Element #11 Maintain BMPs	Element #12 Manage the Project	Element #13 Protect Low Impact Development
BMP C101: Preserving Natural Vegetation	✓								
BMP C102: Buffer Zones	✓								✓
BMP C103: High Visibility Plastic or Metal Fence	✓								✓
BMP C105: Stabilized Construction Entrance / Exit		✓							
BMP C106: Wheel Wash		✓							
BMP C107: Construction Road/Parking Area Stabilization		✓							
BMP C120: Temporary and Permanent Seeding			✓	✓					
BMP C121: Mulching			✓	✓					
BMP C122: Nets and Blankets			✓	✓	✓				
BMP C123: Plastic Covering			✓						
BMP C124: Sodding			✓						
BMP C125: Topsoiling / Composting			✓						
BMP C126: Polyacrylamide for Soil Erosion Protection			✓						
BMP C130: Surface Roughening			✓	✓					
BMP C131: Gradient Terraces			✓	✓					
BMP C140: Dust Control			✓						
BMP C150: Materials On Hand							✓	✓	
BMP C151: Concrete Handling						✓			
BMP C152: Sawcutting and Surfacing Pollution Prevention						✓			
BMP C153: Material Delivery, Storage and Containment						✓			
BMP C154: Concrete Washout Area						✓			
BMP C160: Certified Erosion and Sediment Control Lead							✓	✓	
BMP C162: Scheduling								✓	

BMP C200: Interceptor Dike and Swale

Purpose Provide a ridge of compacted soil, or a ridge with an upslope swale, at the top or base of a disturbed slope or along the perimeter of a disturbed construction area to convey stormwater. Use the dike and/or swale to intercept the runoff from unprotected areas and direct it to areas where erosion can be controlled. This can prevent storm runoff from entering the work area or sediment-laden runoff from leaving the construction site.

Conditions of Use Where the runoff from an exposed site or disturbed slope must be conveyed to an erosion control facility which can safely convey the stormwater.

- Locate upslope of a construction site to prevent runoff from entering disturbed area.
- When placed horizontally across a disturbed slope, it reduces the amount and velocity of runoff flowing down the slope.
- Locate downslope to collect runoff from a disturbed area and direct water to a sediment basin.

Design and Installation Specifications

- Dike and/or swale and channel must be stabilized with temporary or permanent vegetation or other channel protection during construction.
- Channel requires a positive grade for drainage; steeper grades require channel protection and check dams.
- Review construction for areas where overtopping may occur.
- Can be used at top of new fill before vegetation is established.
- May be used as a permanent diversion channel to carry the runoff.
- Sub-basin tributary area should be one acre or less.
- Design capacity for the peak flow from a 10-year, 24-hour storm, assuming a Type 1A rainfall distribution, for temporary facilities. Alternatively, use 1.6 times the 10-year, 1-hour flow indicated by an approved continuous runoff model. For facilities that will also serve on a permanent basis, consult the local government's drainage requirements.

Interceptor dikes shall meet the following criteria:

Top Width	2 feet minimum.
Height	1.5 feet minimum on berm.
Side Slope	2H:1V or flatter.
Grade	Depends on topography, however, dike system minimum is 0.5%, and maximum is 1%.
Compaction	Minimum of 90 percent ASTM D698 standard proctor.

Horizontal Spacing of Interceptor Dikes:

Average Slope	**Slope Percent**	**Flowpath Length**
20H:1V or less	3-5%	300 feet
(10 to 20)H:1V	5-10%	200 feet
(4 to 10)H:1V	10-25%	100 feet
(2 to 4)H:1V	25-50%	50 feet

Stabilization depends on velocity and reach

Slopes <5% Seed and mulch applied within 5 days of dike construction (see BMP C121, Mulching).

Slopes 5 - 40% Dependent on runoff velocities and dike materials. Stabilization should be done immediately using either sod or riprap or other measures to avoid erosion.

- The upslope side of the dike shall provide positive drainage to the dike outlet. No erosion shall occur at the outlet. Provide energy dissipation measures as necessary. Sediment-laden runoff must be released through a sediment trapping facility.
- Minimize construction traffic over temporary dikes. Use temporary cross culverts for channel crossing.

Interceptor swales shall meet the following criteria:

Bottom Width 2 feet minimum; the cross-section bottom shall be level.

Depth 1-foot minimum.

Side Slope 2H:1V or flatter.

Grade Maximum 5 percent, with positive drainage to a suitable outlet (such as a sediment pond).

Stabilization Seed as per BMP C120, *Temporary and Permanent Seeding*, or *BMP C202*, *Channel Lining*, 12 inches thick riprap pressed into the bank and extending at least 8 inches vertical from the bottom.

- Inspect diversion dikes and interceptor swales once a week and after every rainfall. Immediately remove sediment from the flow area.
- Damage caused by construction traffic or other activity must be repaired before the end of each working day.

Check outlets and make timely repairs as needed to avoid gully formation. When the area below the temporary diversion dike is permanently stabilized, remove the dike and fill and stabilize the channel to blend with the natural surface.

BMP C202: Channel Lining

Purpose

To protect channels by providing a channel liner using either blankets or riprap.

Conditions of Use

When natural soils or vegetated stabilized soils in a channel are not adequate to prevent channel erosion.

- When a permanent ditch or pipe system is to be installed and a temporary measure is needed.
- In almost all cases, synthetic and organic coconut blankets are more effective than riprap for protecting channels from erosion. Blankets can be used with and without vegetation. Blanketed channels can be designed to handle any expected flow and longevity requirement. Some synthetic blankets have a predicted life span of 50 years or more, even in sunlight.
- Other reasons why blankets are better than rock include the availability of blankets over rock. In many areas of the state, rock is not easily obtainable or is very expensive to haul to a site. Blankets can be delivered anywhere. Rock requires the use of dump trucks to haul and heavy equipment to place. Blankets usually only require laborers with hand tools, and sometimes a backhoe.
- The Federal Highway Administration recommends not using flexible liners whenever the slope exceeds 10 percent or the shear stress exceeds 8 lbs/ft^2.

Design and Installation Specifications

See BMP C122 for information on blankets.

Since riprap is used where erosion potential is high, construction must be sequenced so that the riprap is put in place with the minimum possible delay.

- Disturbance of areas where riprap is to be placed should be undertaken only when final preparation and placement of the riprap can follow immediately behind the initial disturbance. Where riprap is used for outlet protection, the riprap should be placed before or in conjunction with the construction of the pipe or channel so that it is in place when the pipe or channel begins to operate.
- The designer, after determining the riprap size that will be stable under the flow conditions, shall consider that size to be a minimum size and then, based on riprap gradations actually available in the area, select the size or sizes that equal or exceed the minimum size. The possibility of drainage structure damage by children shall be considered in selecting a riprap size, especially if there is nearby water or a gully in which to toss the stones.
- Stone for riprap shall consist of field stone or quarry stone of approximately rectangular shape. The stone shall be hard and angular

and of such quality that it will not disintegrate on exposure to water or weathering and it shall be suitable in all respects for the purpose intended.

- A lining of engineering filter fabric (geotextile) shall be placed between the riprap and the underlying soil surface to prevent soil movement into or through the riprap. The geotextile should be keyed in at the top of the bank.
- Filter fabric shall not be used on slopes greater than 1-1/2H:1V as slippage may occur. It should be used in conjunction with a layer of coarse aggregate (granular filter blanket) when the riprap to be placed is 12 inches and larger.

BMP C203: Water Bars

Purpose

A small ditch or ridge of material is constructed diagonally across a road or right-of-way to divert stormwater runoff from the road surface, wheel tracks, or a shallow road ditch. See Figure 4.2.3.

Conditions of use

Clearing right-of-way and construction of access for power lines, pipelines, and other similar installations often require long narrow right-of-ways over sloping terrain. Disturbance and compaction promotes gully formation in these cleared strips by increasing the volume and velocity of runoff. Gully formation may be especially severe in tire tracks and ruts. To prevent gullying, runoff can often be diverted across the width of the right-of-way to undisturbed areas by using small predesigned diversions.

- Give special consideration to each individual outlet area, as well as to the cumulative effect of added diversions. Use gravel to stabilize the diversion where significant vehicular traffic is anticipated.

Design and Installation Specifications

Height: 8-inch minimum measured from the channel bottom to the ridge top.

- Side slope of channel: 2H:1V maximum; 3H:1V or flatter when vehicles will cross.
- Base width of ridge: 6-inch minimum.
- Locate them to use natural drainage systems and to discharge into well vegetated stable areas.
- Guideline for Spacing:

Slope %	**Spacing (ft)**
< 5	125
5 - 10	100
10 - 20	75
20 - 35	50
> 35	Use rock lined ditch

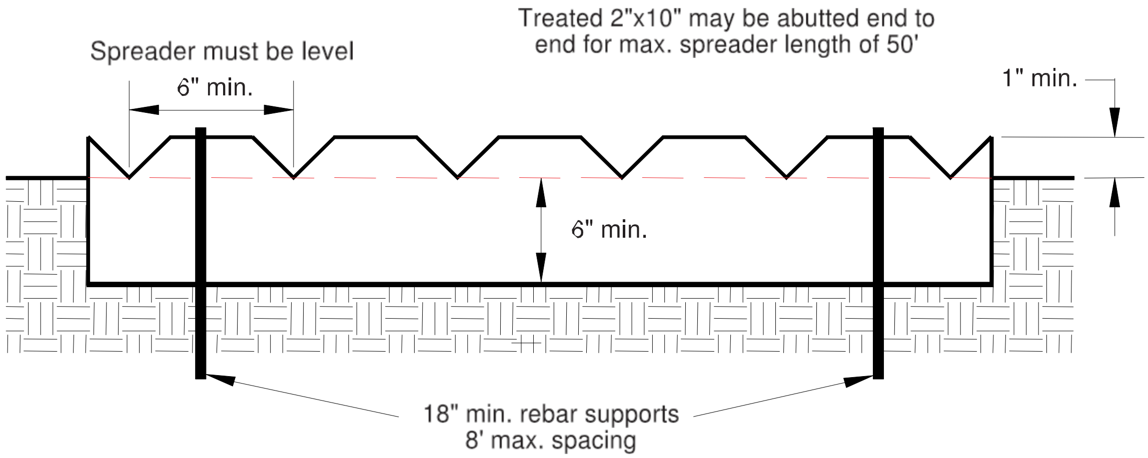


Figure 4.2.6 – Detail of Level Spreader

BMP C207: Check Dams

Purpose Construction of small dams across a swale or ditch reduces the velocity of concentrated flow and dissipates energy at the check dam.

Conditions of Use Where temporary channels or permanent channels are not yet vegetated, channel lining is infeasible, and/or velocity checks are required.

- Check dams may not be placed in streams unless approved by the State Department of Fish and Wildlife. Check dams may not be placed in wetlands without approval from a permitting agency.
- Do not place check dams below the expected backwater from any salmonid bearing water between October 1 and May 31 to ensure that there is no loss of high flow refuge habitat for overwintering juvenile salmonids and emergent salmonid fry.
- Construct rock check dams from appropriately sized rock. The rock used must be large enough to stay in place given the expected design flow through the channel. The rock must be placed by hand or by mechanical means (no dumping of rock to form dam) to achieve complete coverage of the ditch or swale and to ensure that the center of the dam is lower than the edges.
- Check dams may also be constructed of either rock or pea-gravel filled bags. Numerous new products are also available for this purpose. They tend to be re-usable, quick and easy to install, effective, and cost efficient.
- Place check dams perpendicular to the flow of water.
- The dam should form a triangle when viewed from the side. This prevents undercutting as water flows over the face of the dam rather than falling directly onto the ditch bottom.

- Before installing check dams impound and bypass upstream water flow away from the work area. Options for bypassing include pumps, siphons, or temporary channels.
- Check dams in association with sumps work more effectively at slowing flow and retaining sediment than just a check dam alone. A deep sump should be provided immediately upstream of the check dam.
- In some cases, if carefully located and designed, check dams can remain as permanent installations with very minor regrading. They may be left as either spillways, in which case accumulated sediment would be graded and seeded, or as check dams to prevent further sediment from leaving the site.
- The maximum spacing between the dams shall be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.
- Keep the maximum height at 2 feet at the center of the dam.
- Keep the center of the check dam at least 12 inches lower than the outer edges at natural ground elevation.
- Keep the side slopes of the check dam at 2H:1V or flatter.
- Key the stone into the ditch banks and extend it beyond the abutments a minimum of 18 inches to avoid washouts from overflow around the dam.
- Use filter fabric foundation under a rock or sand bag check dam. If a blanket ditch liner is used, filter fabric is not necessary. A piece of organic or synthetic blanket cut to fit will also work for this purpose.
- In the case of grass-lined ditches and swales, all check dams and accumulated sediment shall be removed when the grass has matured sufficiently to protect the ditch or swale - unless the slope of the swale is greater than 4 percent. The area beneath the check dams shall be seeded and mulched immediately after dam removal.
- Ensure that channel appurtenances, such as culvert entrances below check dams, are not subject to damage or blockage from displaced stones. Figure 4.2.7 depicts a typical rock check dam.

Maintenance Standards

Check dams shall be monitored for performance and sediment accumulation during and after each runoff producing rainfall. Sediment shall be removed when it reaches one half the sump depth.

- Anticipate submergence and deposition above the check dam and erosion from high flows around the edges of the dam.
- If significant erosion occurs between dams, install a protective riprap liner in that portion of the channel.

Approved as Equivalent

Ecology has approved products as able to meet the requirements of BMP C207. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept this product approved as equivalent, or may require additional testing prior to consideration for local use. The products are available for review on Ecology's website at http://www.ecy.wa.gov/programs/wq/stormwater/newtech/equivalent.html

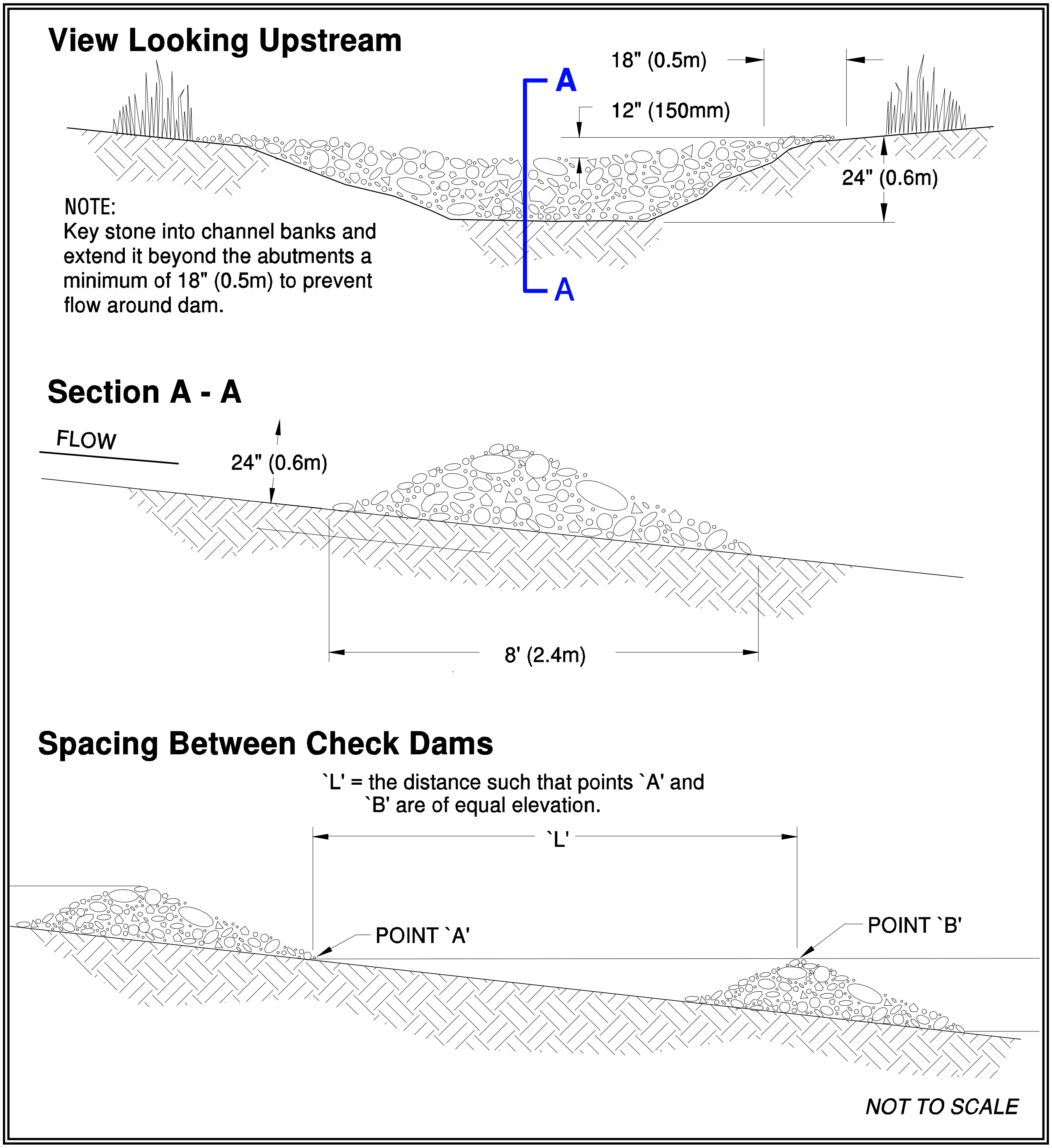


Figure 4.2.7 – Rock Check Dam

Standards

accumulation during and after each runoff producing rainfall. Sediment shall be removed when it reaches one half the height of the dam.

- Anticipate submergence and deposition above the triangular silt dam and erosion from high flows around the edges of the dam. Immediately repair any damage or any undercutting of the dam.

BMP C209: Outlet Protection

Purpose

Outlet protection prevents scour at conveyance outlets and minimizes the potential for downstream erosion by reducing the velocity of concentrated stormwater flows.

Conditions of use

Outlet protection is required at the outlets of all ponds, pipes, ditches, or other conveyances, and where runoff is conveyed to a natural or manmade drainage feature such as a stream, wetland, lake, or ditch.

Design and Installation Specifications

The receiving channel at the outlet of a culvert shall be protected from erosion by rock lining a minimum of 6 feet downstream and extending up the channel sides a minimum of 1–foot above the maximum tailwater elevation or 1-foot above the crown, whichever is higher. For large pipes (more than 18 inches in diameter), the outlet protection lining of the channel is lengthened to four times the diameter of the culvert.

- Standard wingwalls, and tapered outlets and paved channels should also be considered when appropriate for permanent culvert outlet protection. (See WSDOT Hydraulic Manual, available through WSDOT Engineering Publications).
- Organic or synthetic erosion blankets, with or without vegetation, are usually more effective than rock, cheaper, and easier to install. Materials can be chosen using manufacturer product specifications. ASTM test results are available for most products and the designer can choose the correct material for the expected flow.
- With low flows, vegetation (including sod) can be effective.
- The following guidelines shall be used for riprap outlet protection:
  1. If the discharge velocity at the outlet is less than 5 fps (pipe slope less than 1 percent), use 2-inch to 8-inch riprap. Minimum thickness is 1-foot.
  2. For 5 to 10 fps discharge velocity at the outlet (pipe slope less than 3 percent), use 24-inch to 48-inch riprap. Minimum thickness is 2 feet.
  3. For outlets at the base of steep slope pipes (pipe slope greater than 10 percent), an engineered energy dissipater shall be used.
- Filter fabric or erosion control blankets should always be used under riprap to prevent scour and channel erosion.

- New pipe outfalls can provide an opportunity for low-cost fish habitat improvements. For example, an alcove of low-velocity water can be created by constructing the pipe outfall and associated energy dissipater back from the stream edge and digging a channel, over-widened to the upstream side, from the outfall. Overwintering juvenile and migrating adult salmonids may use the alcove as shelter during high flows. Bank stabilization, bioengineering, and habitat features may be required for disturbed areas. This work may require a HPA. See Volume V for more information on outfall system design.

Maintenance Standards

- Inspect and repair as needed.
- Add rock as needed to maintain the intended function.
- Clean energy dissipater if sediment builds up.

BMP C220: Storm Drain Inlet Protection

Purpose

Storm drain inlet protection prevents coarse sediment from entering drainage systems prior to permanent stabilization of the disturbed area.

Conditions of Use

Use storm drain inlet protection at inlets that are operational before permanent stabilization of the disturbed drainage area. Provide protection for all storm drain inlets downslope and within 500 feet of a disturbed or construction area, unless conveying runoff entering catch basins to a sediment pond or trap.

Also consider inlet protection for lawn and yard drains on new home construction. These small and numerous drains coupled with lack of gutters in new home construction can add significant amounts of sediment into the roof drain system. If possible delay installing lawn and yard drains until just before landscaping or cap these drains to prevent sediment from entering the system until completion of landscaping. Provide 18-inches of sod around each finished lawn and yard drain.

Table 4.2.2 lists several options for inlet protection. All of the methods for storm drain inlet protection tend to plug and require a high frequency of maintenance. Limit drainage areas to one acre or less. Possibly provide emergency overflows with additional end-of-pipe treatment where stormwater ponding would cause a hazard.

Table 4.2.2
Storm Drain Inlet Protection

Type of Inlet Protection	Emergency Overflow	Applicable for Paved/ Earthen Surfaces	Conditions of Use
Drop Inlet Protection			
Excavated drop inlet protection	Yes, temporary flooding will occur	Earthen	Applicable for heavy flows. Easy to maintain. Large area Requirement: 30' X 30'/acre
Block and gravel drop inlet protection	Yes	Paved or Earthen	Applicable for heavy concentrated flows. Will not pond.
Gravel and wire drop inlet protection	No		Applicable for heavy concentrated flows. Will pond. Can withstand traffic.
Catch basin filters	Yes	Paved or Earthen	Frequent maintenance required.
Curb Inlet Protection			
Curb inlet protection with a wooden weir	Small capacity overflow	Paved	Used for sturdy, more compact installation.
Block and gravel curb inlet protection	Yes	Paved	Sturdy, but limited filtration.
Culvert Inlet Protection			
Culvert inlet sediment trap			18 month expected life.

Design and Installation Specifications

Excavated Drop Inlet Protection - An excavated impoundment around the storm drain. Sediment settles out of the stormwater prior to entering the storm drain.

- Provide a depth of 1-2 ft as measured from the crest of the inlet structure.
- Slope sides of excavation no steeper than 2H:1V.
- Minimum volume of excavation 35 cubic yards.
- Shape basin to fit site with longest dimension oriented toward the longest inflow area.
- Install provisions for draining to prevent standing water problems.
- Clear the area of all debris.
- Grade the approach to the inlet uniformly.
- Drill weep holes into the side of the inlet.
- Protect weep holes with screen wire and washed aggregate.
- Seal weep holes when removing structure and stabilizing area.

- Build a temporary dike, if necessary, to the down slope side of the structure to prevent bypass flow.

Block and Gravel Filter - A barrier formed around the storm drain inlet with standard concrete blocks and gravel. See Figure 4.2.8.

- Provide a height of 1 to 2 feet above inlet.
- Recess the first row 2-inches into the ground for stability.
- Support subsequent courses by placing a 2x4 through the block opening.
- Do not use mortar.
- Lay some blocks in the bottom row on their side for dewatering the pool.
- Place hardware cloth or comparable wire mesh with ½-inch openings over all block openings.
- Place gravel just below the top of blocks on slopes of 2H:1V or flatter.
- An alternative design is a gravel donut.
- Provide an inlet slope of 3H:1V.
- Provide an outlet slope of 2H:1V.
- Provide a1-foot wide level stone area between the structure and the inlet.
- Use inlet slope stones 3 inches in diameter or larger.
- Use gravel ½- to ¾-inch at a minimum thickness of 1-foot for the outlet slope.

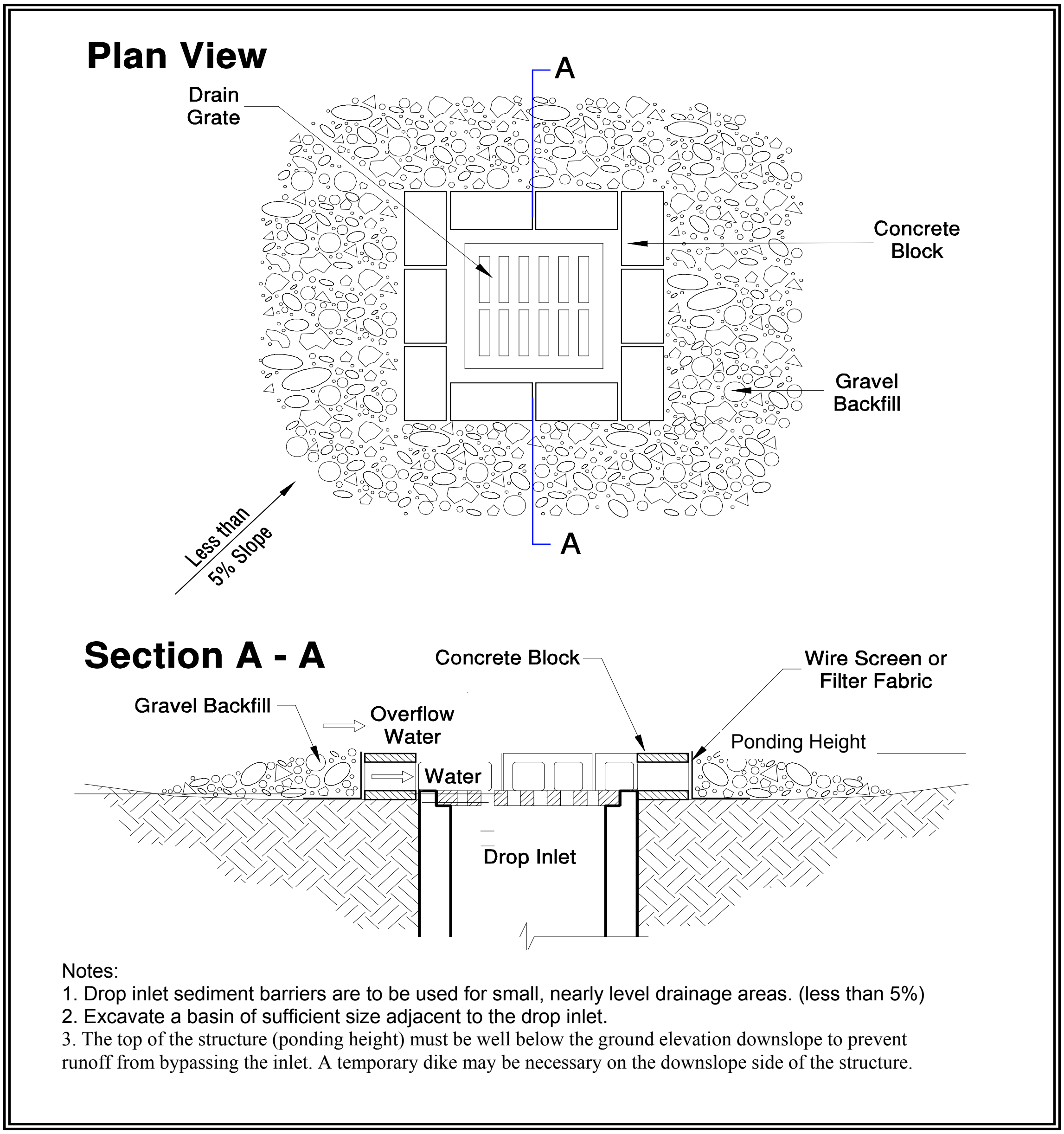


Figure 4.2.8 – Block and Gravel Filter

Gravel and Wire Mesh Filter - A gravel barrier placed over the top of the inlet. This structure does not provide an overflow.

- Use a hardware cloth or comparable wire mesh with ½-inch openings.
- Use coarse aggregate.
- Provide a height 1-foot or more, 18-inches wider than inlet on all sides.
- Place wire mesh over the drop inlet so that the wire extends a minimum of 1-foot beyond each side of the inlet structure.
- Overlap the strips if more than one strip of mesh is necessary.

- Place coarse aggregate over the wire mesh.
- Provide at least a 12-inch depth of gravel over the entire inlet opening and extend at least 18-inches on all sides.

Catchbasin Filters – Use inserts designed by manufacturers for construction sites. The limited sediment storage capacity increases the amount of inspection and maintenance required, which may be daily for heavy sediment loads. To reduce maintenance requirements combine a catchbasin filter with another type of inlet protection. This type of inlet protection provides flow bypass without overflow and therefore may be a better method for inlets located along active rights-of-way.

- Provides 5 cubic feet of storage.
- Requires dewatering provisions.
- Provides a high-flow bypass that will not clog under normal use at a construction site.
- Insert the catchbasin filter in the catchbasin just below the grating.

Curb Inlet Protection with Wooden Weir – Barrier formed around a curb inlet with a wooden frame and gravel.

- Use wire mesh with ½-inch openings.
- Use extra strength filter cloth.
- Construct a frame.
- Attach the wire and filter fabric to the frame.
- Pile coarse washed aggregate against wire/fabric.
- Place weight on frame anchors.

Block and Gravel Curb Inlet Protection – Barrier formed around a curb inlet with concrete blocks and gravel. See Figure 4.2.9.

- Use wire mesh with ½-inch openings.
- Place two concrete blocks on their sides abutting the curb at either side of the inlet opening. These are spacer blocks.
- Place a 2x4 stud through the outer holes of each spacer block to align the front blocks.
- Place blocks on their sides across the front of the inlet and abutting the spacer blocks.
- Place wire mesh over the outside vertical face.
- Pile coarse aggregate against the wire to the top of the barrier.

Curb and Gutter Sediment Barrier – Sandbag or rock berm (riprap and aggregate) 3 feet high and 3 feet wide in a horseshoe shape. See Figure 4.2.10.

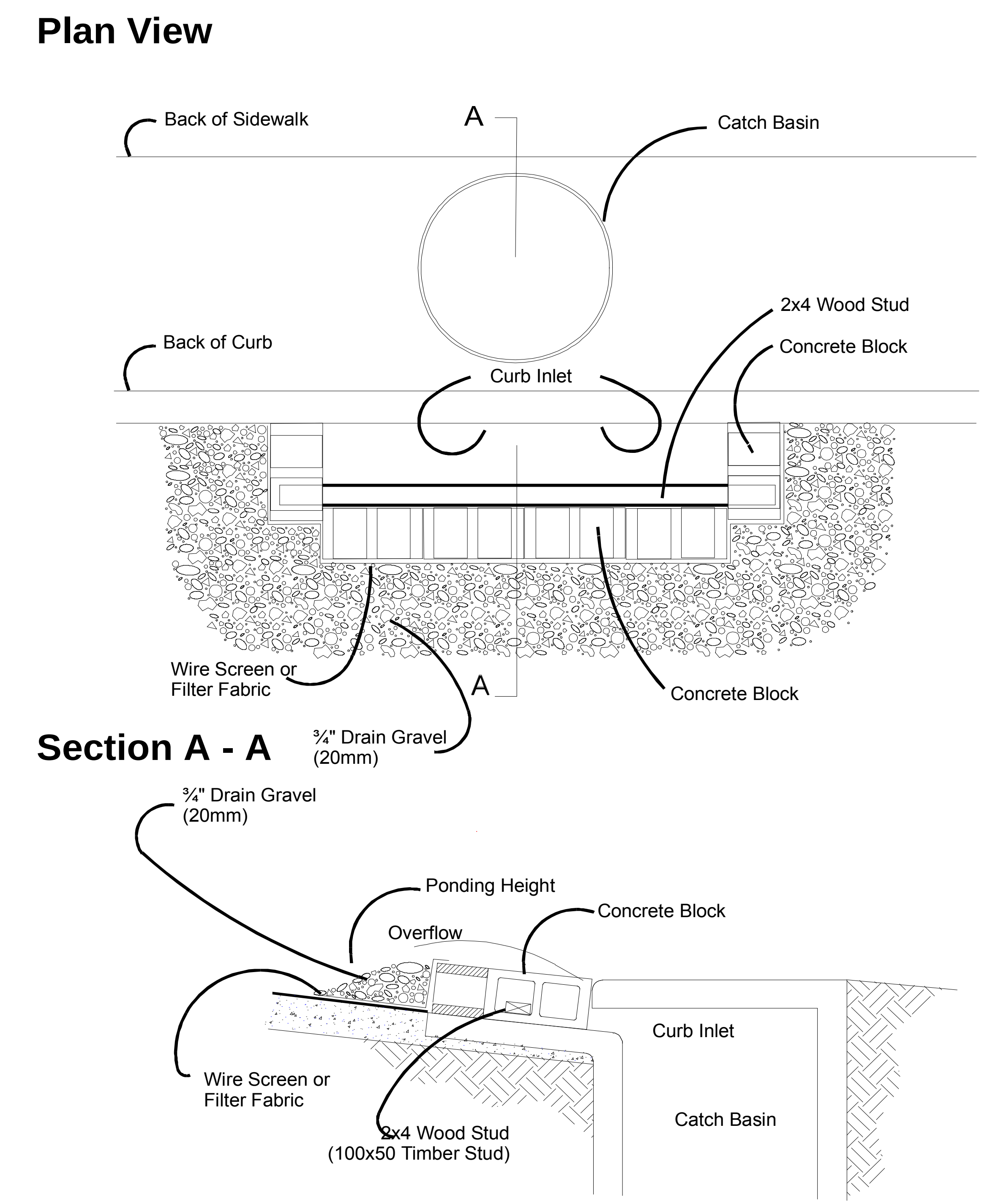
- Construct a horseshoe shaped berm, faced with coarse aggregate if using riprap, 3 feet high and 3 feet wide, at least 2 feet from the inlet.
- Construct a horseshoe shaped sedimentation trap on the outside of the berm sized to sediment trap standards for protecting a culvert inlet.

Maintenance Standards

- Inspect catch basin filters frequently, especially after storm events. Clean and replace clogged inserts. For systems with clogged stone filters: pull away the stones from the inlet and clean or replace. An alternative approach would be to use the clogged stone as fill and put fresh stone around the inlet.
- Do not wash sediment into storm drains while cleaning. Spread all excavated material evenly over the surrounding land area or stockpile and stabilize as appropriate.

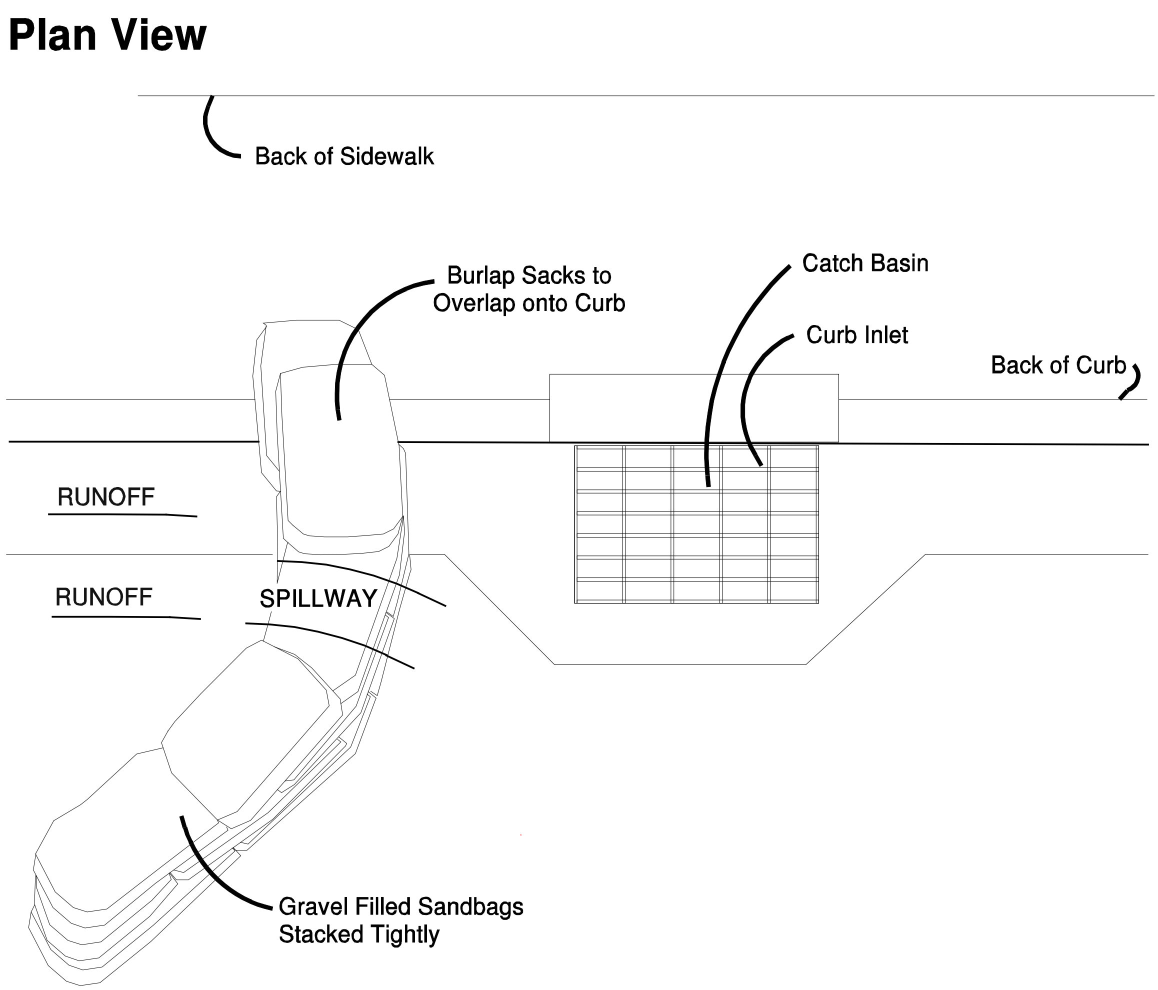
Approved as Equivalent

Ecology has approved products as able to meet the requirements of BMP C220. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept this product approved as equivalent, or may require additional testing prior to consideration for local use. The products are available for review on Ecology's website at http://www.ecy.wa.gov/programs/wq/stormwater/newtech/equivalent.html



NOTES:
1. Use block and gravel type sediment barrier when curb inlet is located in gently sloping street segment, where water can pond and allow sediment to separate from runoff.
2. Barrier shall allow for overflow from severe storm event.
3. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

Figure 4.2.9 – Block and Gravel Curb Inlet Protection



NOTES:
1. Place curb type sediment barriers on gently sloping street segments, where water can pond and allow sediment to separate from runoff.
2. Sandbags of either burlap or woven `geotextile' fabric, are filled with gravel, layered and packed tightly.
3. Leave a one sandbag gap in the top row to provide a spillway for overflow.
4. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

Figure 4.2.10 – Curb and Gutter Barrier

BMP C232: Gravel Filter Berm

Purpose A gravel filter berm is constructed on rights-of-way or traffic areas within a construction site to retain sediment by using a filter berm of gravel or crushed rock.

Conditions of Use Where a temporary measure is needed to retain sediment from rights-of-way or in traffic areas on construction sites.

Design and Installation Specifications

- Berm material shall be ¾ to 3 inches in size, washed well-grade gravel or crushed rock with less than 5 percent fines.
- Spacing of berms:
  - Every 300 feet on slopes less than 5 percent
  - Every 200 feet on slopes between 5 percent and 10 percent
  - Every 100 feet on slopes greater than 10 percent
- Berm dimensions:
  - 1 foot high with 3H:1V side slopes
  - 8 linear feet per 1 cfs runoff based on the 10-year, 24-hour design storm

Maintenance Standards

- Regular inspection is required. Sediment shall be removed and filter material replaced as needed.

BMP C233: Silt Fence

Purpose Use of a silt fence reduces the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow. See Figure 4.2.12 for details on silt fence construction.

Conditions of Use Silt fence may be used downslope of all disturbed areas.

- Silt fence shall prevent soil carried by runoff water from going beneath, through, or over the top of the silt fence, but shall allow the water to pass through the fence.
- Silt fence is not intended to treat concentrated flows, nor is it intended to treat substantial amounts of overland flow. Convey any concentrated flows through the drainage system to a sediment pond.
- Do not construct silt fences in streams or use in V-shaped ditches. Silt fences do not provide an adequate method of silt control for anything deeper than sheet or overland flow.

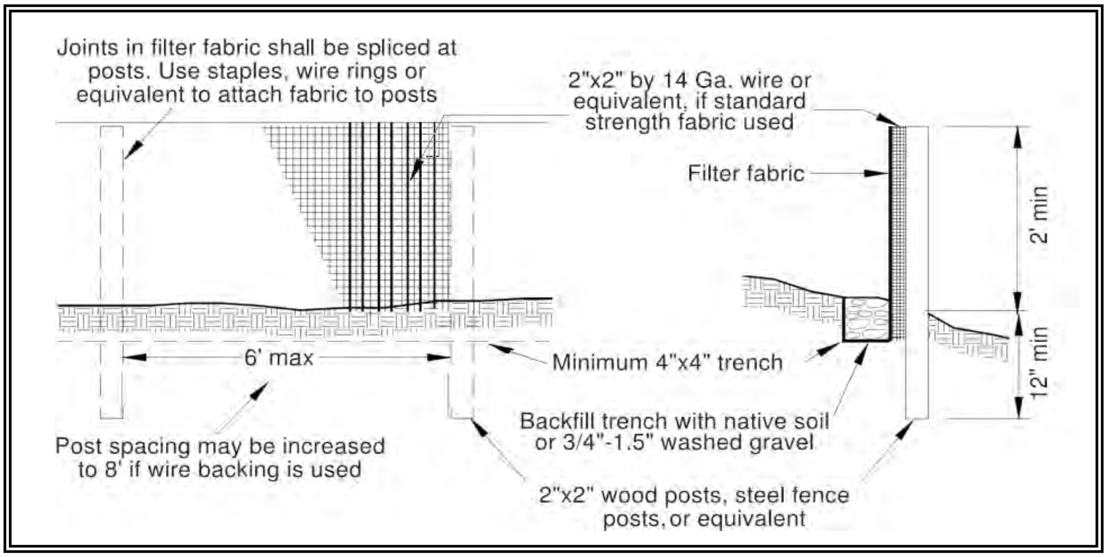


Figure 4.2.12 – Silt Fence

Design and Installation Specifications

- Use in combination with sediment basins or other BMPs.
- Maximum slope steepness (normal (perpendicular) to fence line) 1H:1V.
- Maximum sheet or overland flow path length to the fence of 100 feet.
- Do not allow flows greater than 0.5 cfs.
- The geotextile used shall meet the following standards. All geotextile properties listed below are minimum average roll values (i.e., the test result for any sampled roll in a lot shall meet or exceed the values shown in Table 4.2.3):

Table 4.2.3
Geotextile Standards

Polymeric Mesh AOS (ASTM D4751)	0.60 mm maximum for slit film woven (#30 sieve). 0.30 mm maximum for all other geotextile types (#50 sieve). 0.15 mm minimum for all fabric types (#100 sieve).
Water Permittivity (ASTM D4491)	0.02 sec^{-1} minimum
Grab Tensile Strength (ASTM D4632)	180 lbs. Minimum for extra strength fabric. 100 lbs minimum for standard strength fabric.
Grab Tensile Strength (ASTM D4632)	30% maximum
Ultraviolet Resistance (ASTM D4355)	70% minimum

- Support standard strength fabrics with wire mesh, chicken wire, 2-inch x 2-inch wire, safety fence, or jute mesh to increase the strength of the fabric. Silt fence materials are available that have synthetic mesh backing attached.

- Filter fabric material shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0°F. to 120°F.
- One-hundred percent biodegradable silt fence is available that is strong, long lasting, and can be left in place after the project is completed, if permitted by local regulations.
- Refer to Figure 4.2.12 for standard silt fence details. Include the following standard Notes for silt fence on construction plans and specifications:

    1. The contractor shall install and maintain temporary silt fences at the locations shown in the Plans.
    2. Construct silt fences in areas of clearing, grading, or drainage prior to starting those activities.
    3. The silt fence shall have a 2-feet min. and a 2½-feet max. height above the original ground surface.
    4. The filter fabric shall be sewn together at the point of manufacture to form filter fabric lengths as required. Locate all sewn seams at support posts. Alternatively, two sections of silt fence can be overlapped, provided the Contractor can demonstrate, to the satisfaction of the Engineer, that the overlap is long enough and that the adjacent fence sections are close enough together to prevent silt laden water from escaping through the fence at the overlap.
    5. Attach the filter fabric on the up-slope side of the posts and secure with staples, wire, or in accordance with the manufacturer's recommendations. Attach the filter fabric to the posts in a manner that reduces the potential for tearing.
    6. Support the filter fabric with wire or plastic mesh, dependent on the properties of the geotextile selected for use. If wire or plastic mesh is used, fasten the mesh securely to the up-slope side of the posts with the filter fabric up-slope of the mesh.
    7. Mesh support, if used, shall consist of steel wire with a maximum mesh spacing of 2-inches, or a prefabricated polymeric mesh. The strength of the wire or polymeric mesh shall be equivalent to or greater than 180 lbs. grab tensile strength. The polymeric mesh must be as resistant to the same level of ultraviolet radiation as the filter fabric it supports.
    8. Bury the bottom of the filter fabric 4-inches min. below the ground surface. Backfill and tamp soil in place over the buried portion of the filter fabric, so that no flow can pass beneath the fence and

scouring cannot occur. When wire or polymeric back-up support mesh is used, the wire or polymeric mesh shall extend into the ground 3-inches min.

9. Drive or place the fence posts into the ground 18-inches min. A 12–inch min. depth is allowed if topsoil or other soft subgrade soil is not present and 18-inches cannot be reached. Increase fence post min. depths by 6 inches if the fence is located on slopes of 3H:1V or steeper and the slope is perpendicular to the fence. If required post depths cannot be obtained, the posts shall be adequately secured by bracing or guying to prevent overturning of the fence due to sediment loading.

10. Use wood, steel or equivalent posts. The spacing of the support posts shall be a maximum of 6-feet. Posts shall consist of either:

    - Wood with dimensions of 2-inches by 2-inches wide min. and a 3-feet min. length. Wood posts shall be free of defects such as knots, splits, or gouges.
    - No. 6 steel rebar or larger.
    - ASTM A 120 steel pipe with a minimum diameter of 1-inch.
    - U, T, L, or C shape steel posts with a minimum weight of 1.35 lbs./ft.
    - Other steel posts having equivalent strength and bending resistance to the post sizes listed above.

11. Locate silt fences on contour as much as possible, except at the ends of the fence, where the fence shall be turned uphill such that the silt fence captures the runoff water and prevents water from flowing around the end of the fence.

12. If the fence must cross contours, with the exception of the ends of the fence, place gravel check dams perpendicular to the back of the fence to minimize concentrated flow and erosion. The slope of the fence line where contours must be crossed shall not be steeper than 3H:1V.

    - Gravel check dams shall be approximately 1-foot deep at the back of the fence. Gravel check dams shall be continued perpendicular to the fence at the same elevation until the top of the check dam intercepts the ground surface behind the fence.
    - Gravel check dams shall consist of crushed surfacing base course, gravel backfill for walls, or shoulder ballast. Gravel check dams shall be located every 10 feet along the fence where the fence must cross contours.

- Refer to Figure 4.2.13 for slicing method details. Silt fence installation using the slicing method specifications:

1. The base of both end posts must be at least 2- to 4-inches above the top of the filter fabric on the middle posts for ditch checks to drain properly. Use a hand level or string level, if necessary, to mark base points before installation.
2. Install posts 3- to 4-feet apart in critical retention areas and 6- to 7-feet apart in standard applications.
3. Install posts 24-inches deep on the downstream side of the silt fence, and as close as possible to the filter fabric, enabling posts to support the filter fabric from upstream water pressure.
4. Install posts with the nipples facing away from the filter fabric.
5. Attach the filter fabric to each post with three ties, all spaced within the top 8-inches of the filter fabric. Attach each tie diagonally 45 degrees through the filter fabric, with each puncture at least 1-inch vertically apart. Each tie should be positioned to hang on a post nipple when tightening to prevent sagging.
6. Wrap approximately 6-inches of fabric around the end posts and secure with 3 ties.
7. No more than 24-inches of a 36-inch filter fabric is allowed above ground level.

   Compact the soil immediately next to the filter fabric with the front wheel of the tractor, skid steer, or roller exerting at least 60 pounds per square inch. Compact the upstream side first and then each side twice for a total of four trips. Check and correct the silt fence installation for any deviation before compaction. Use a flat-bladed shovel to tuck fabric deeper into the ground if necessary.

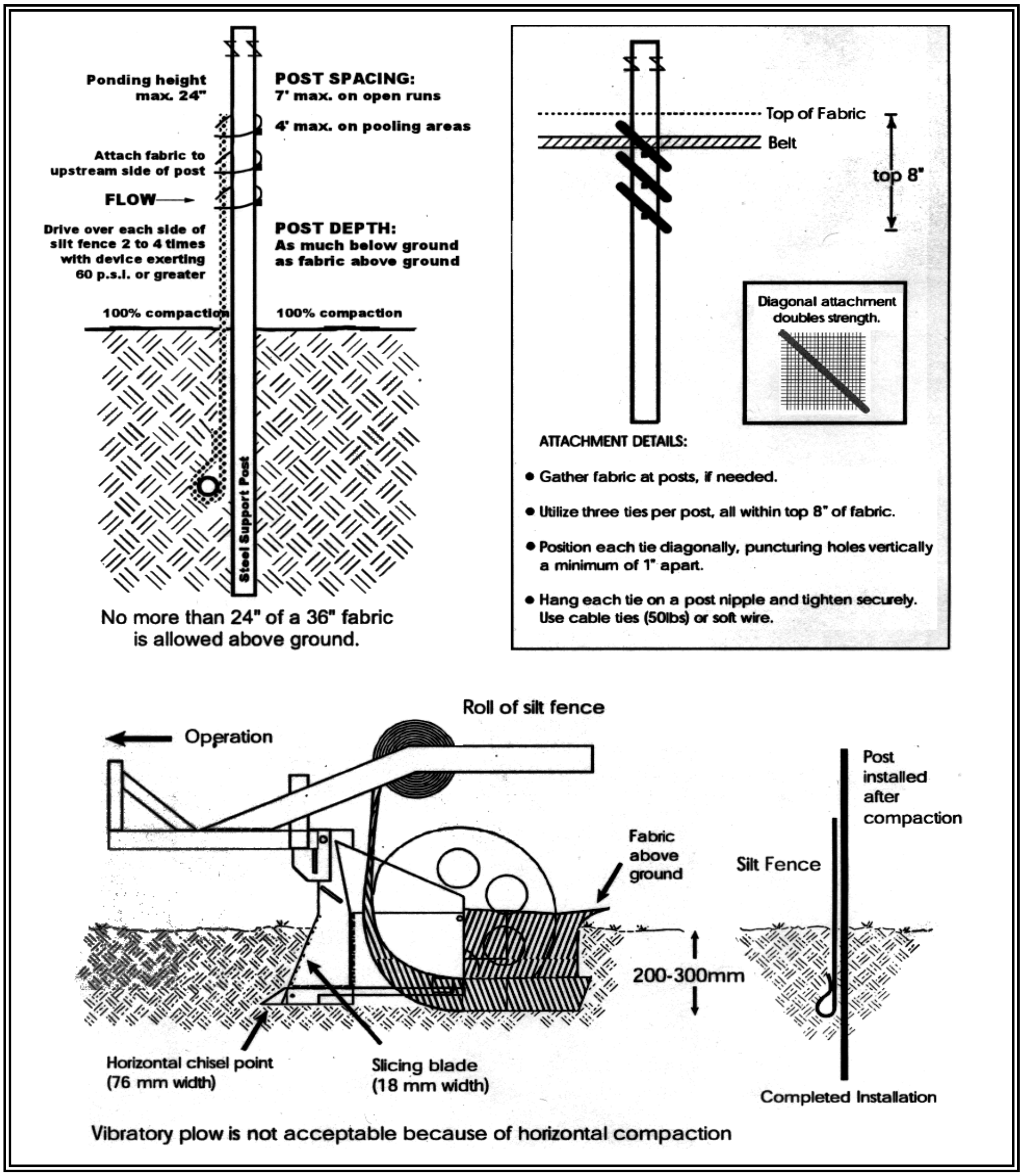


Figure 4.2.13 – Silt Fence Installation by Slicing Method

Maintenance Standards

- Repair any damage immediately.
- Intercept and convey all evident concentrated flows uphill of the silt fence to a sediment pond.
- Check the uphill side of the fence for signs of the fence clogging and acting as a barrier to flow and then causing channelization of flows parallel to the fence. If this occurs, replace the fence or remove the trapped sediment.

- Remove sediment deposits when the deposit reaches approximately one-third the height of the silt fence, or install a second silt fence.
- Replace filter fabric that has deteriorated due to ultraviolet breakdown.

BMP C234: Vegetated Strip

Purpose

Vegetated strips reduce the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow.

Conditions of Use

- Vegetated strips may be used downslope of all disturbed areas.
- Vegetated strips are not intended to treat concentrated flows, nor are they intended to treat substantial amounts of overland flow. Any concentrated flows must be conveyed through the drainage system to a sediment pond. The only circumstance in which overland flow can be treated solely by a strip, rather than by a sediment pond, is when the following criteria are met (see Table 4.2.4):

Table 4.2.4
Contributing Drainage Area for Vegetated Strips

Average Contributing area Slope	Average Contributing area Percent Slope	Max Contributing area Flowpath Length
1.5H:1V or flatter	67% or flatter	100 feet
2H:1V or flatter	50% or flatter	115 feet
4H:1V or flatter	25% or flatter	150 feet
6H:1V or flatter	16.7% or flatter	200 feet
10H:1V or flatter	10% or flatter	250 feet

Design and Installation Specifications

- The vegetated strip shall consist of a minimum of a 25-foot flowpath length continuous strip of dense vegetation with topsoil. Grass-covered, landscaped areas are generally not adequate because the volume of sediment overwhelms the grass. Ideally, vegetated strips shall consist of undisturbed native growth with a well-developed soil that allows for infiltration of runoff.
- The slope within the strip shall not exceed 4H:1V.
- The uphill boundary of the vegetated strip shall be delineated with clearing limits.

Maintenance Standards

- Any areas damaged by erosion or construction activity shall be seeded immediately and protected by mulch.
- If more than 5 feet of the original vegetated strip width has had vegetation removed or is being eroded, sod must be installed.
- If there are indications that concentrated flows are traveling across the buffer, surface water controls must be installed to reduce the flows

entering the buffer, or additional perimeter protection must be installed.

BMP C235: Wattles

Purpose

Wattles are temporary erosion and sediment control barriers consisting of straw, compost, or other material that is wrapped in biodegradable tubular plastic or similar encasing material. They reduce the velocity and can spread the flow of rill and sheet runoff, and can capture and retain sediment. Wattles are typically 8 to 10 inches in diameter and 25 to 30 feet in length. Wattles are placed in shallow trenches and staked along the contour of disturbed or newly constructed slopes. See Figure 4.2.14 for typical construction details. WSDOT Standard Plan I-30.30-00 also provides information on Wattles (http://www.wsdot.wa.gov/Design/Standards/Plans.htm#SectionI)

Conditions of Use

- Use wattles:
  - In disturbed areas that require immediate erosion protection.
  - On exposed soils during the period of short construction delays, or over winter months.
  - On slopes requiring stabilization until permanent vegetation can be established.
- The material used dictates the effectiveness period of the wattle. Generally, Wattles are typically effective for one to two seasons.
- Prevent rilling beneath wattles by properly entrenching and abutting wattles together to prevent water from passing between them.

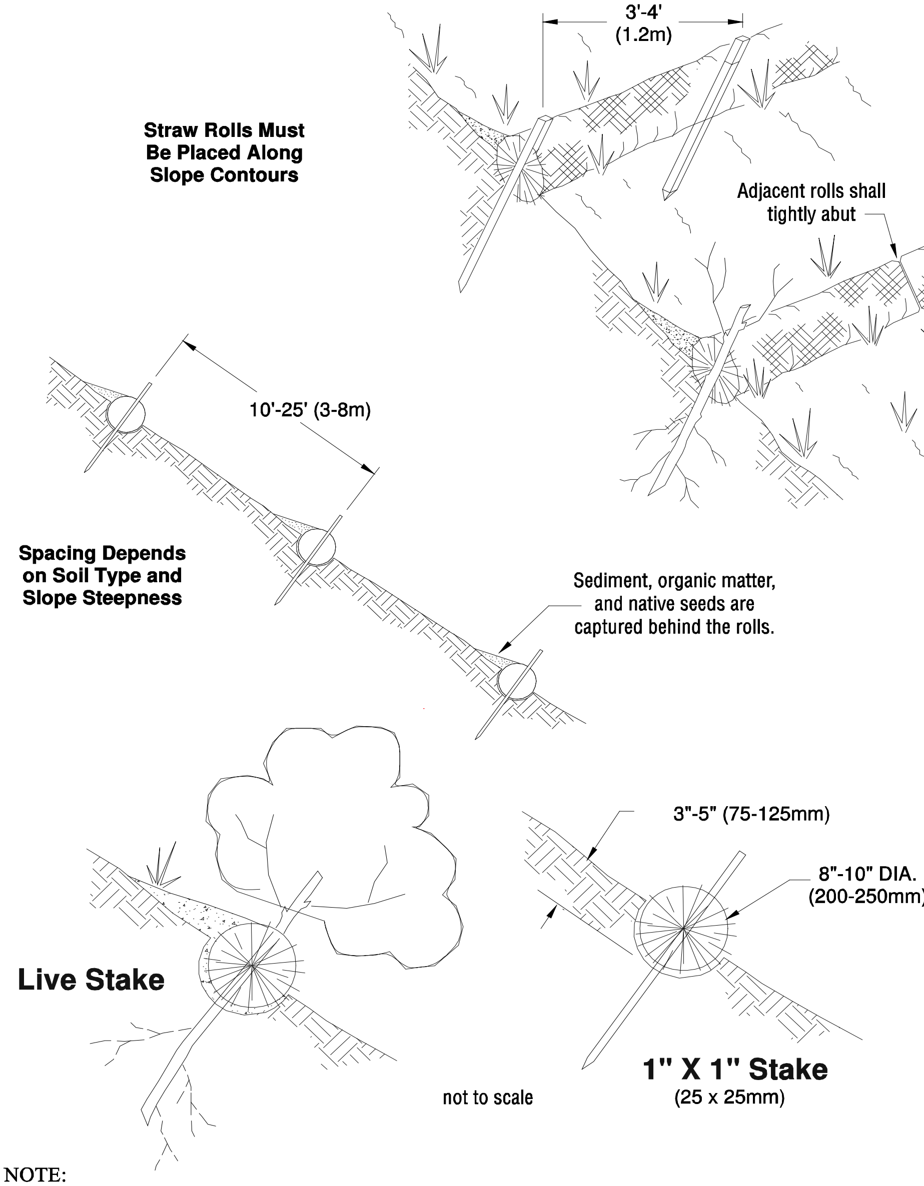
Design Criteria

- Install wattles perpendicular to the flow direction and parallel to the slope contour.
- Narrow trenches should be dug across the slope on contour to a depth of 3- to 5-inches on clay soils and soils with gradual slopes. On loose soils, steep slopes, and areas with high rainfall, the trenches should be dug to a depth of 5- to 7- inches, or 1/2 to 2/3 of the thickness of the wattle.
- Start building trenches and installing wattles from the base of the slope and work up. Spread excavated material evenly along the uphill slope and compacted using hand tamping or other methods.
- Construct trenches at intervals of 10- to 25-feet depending on the steepness of the slope, soil type, and rainfall. The steeper the slope the closer together the trenches.
- Install the wattles snugly into the trenches and abut tightly end to end. Do not overlap the ends.
- Install stakes at each end of the wattle, and at 4-foot centers along entire length of wattle.

- If required, install pilot holes for the stakes using a straight bar to drive holes through the wattle and into the soil.
- Wooden stakes should be approximately 3/4 x 3/4 x 24 inches min. Willow cuttings or 3/8-inch rebar can also be used for stakes.
- Stakes should be driven through the middle of the wattle, leaving 2 to 3 inches of the stake protruding above the wattle.

Maintenance Standards

- Wattles may require maintenance to ensure they are in contact with soil and thoroughly entrenched, especially after significant rainfall on steep sandy soils.



NOTE:
1. Straw roll installation requires the placement and secure staking of the roll in a trench, 3"-5" (75-125mm) deep, dug on contour. runoff must not be allowed to run under or around roll.

Figure 4.2.14 – Wattles

- Inspect the slope after significant storms and repair any areas where wattles are not tightly abutted or water has scoured beneath the wattles.

Approved as Equivalent

Ecology has approved products as able to meet the requirements of BMP C235. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept this product approved as equivalent, or may require additional testing prior to consideration for local use. The products are available for review on Ecology's website at http://www.ecy.wa.gov/programs/wq/stormwater/newtech/equivalent.html

BMP C236: Vegetative Filtration

Purpose

Vegetative Filtration may be used in conjunction with BMP C241 Temporary Sediment Ponds, BMP C206 Level Spreader and a pumping system with surface intake to improve turbidity levels of stormwater discharges by filtering through existing vegetation where undisturbed forest floor duff layer or established lawn with thatch layer are present. Vegetative Filtration can also be used to infiltrate dewatering waste from foundations, vaults, and trenches as long as runoff does not occur.

Conditions of Use

- For every five acre of disturbed soil use one acre of grass field, farm pasture, or wooded area. Reduce or increase this area depending on project size, ground water table height, and other site conditions.
- Wetlands shall not be used for filtration.
- Do not use this BMP in areas with a high ground water table, or in areas that will have a high seasonal ground water table during the use of this BMP.
- This BMP may be less effective on soils that prevent the infiltration of the water, such as hard till.
- Using other effective source control measures throughout a construction site will prevent the generation of additional highly turbid water and may reduce the time period or area need for this BMP.
- Stop distributing water into the vegetated area if standing water or erosion results.

Design Criteria

- Find land adjacent to the project that has a vegetated field, preferably a farm field, or wooded area.
- If the project site does not contain enough vegetated field area consider obtaining permission from adjacent landowners (especially for farm fields).
- Install a pump and downstream distribution manifold depending on the project size. Generally, the main distribution line should reach 100 to 200-feet long (many large projects, or projects on tight soil, will

BMP C240: Sediment Trap

Purpose

A sediment trap is a small temporary ponding area with a gravel outlet used to collect and store sediment from sites cleared and/or graded during construction. Sediment traps, along with other perimeter controls, shall be installed before any land disturbance takes place in the drainage area.

Conditions of Use

Prior to leaving a construction site, stormwater runoff must pass through a sediment pond or trap or other appropriate sediment removal best management practice. Non-engineered sediment traps may be used on-site prior to an engineered sediment trap or sediment pond to provide additional sediment removal capacity.

It is intended for use on sites where the tributary drainage area is less than 3 acres, with no unusual drainage features, and a projected build-out time of six months or less. The sediment trap is a temporary measure (with a design life of approximately 6 months) and shall be maintained until the site area is permanently protected against erosion by vegetation and/or structures.

Sediment traps and ponds are only effective in removing sediment down to about the medium silt size fraction. Runoff with sediment of finer grades (fine silt and clay) will pass through untreated, emphasizing the need to control erosion to the maximum extent first.

Whenever possible, sediment-laden water shall be discharged into on-site, relatively level, vegetated areas (see BMP C234 – Vegetated Strip). This is the only way to effectively remove fine particles from runoff unless chemical treatment or filtration is used. This can be particularly useful after initial treatment in a sediment trap or pond. The areas of release must be evaluated on a site-by-site basis in order to determine appropriate locations for and methods of releasing runoff. Vegetated wetlands shall not be used for this purpose. Frequently, it may be possible to pump water from the collection point at the downhill end of the site to an upslope vegetated area. Pumping shall only augment the treatment system, not replace it, because of the possibility of pump failure or runoff volume in excess of pump capacity.

All projects that are constructing permanent facilities for runoff quantity control should use the rough-graded or final-graded permanent facilities for traps and ponds. This includes combined facilities and infiltration facilities. When permanent facilities are used as temporary sedimentation facilities, the surface area requirement of a sediment trap or pond must be met. If the surface area requirements are larger than the surface area of the permanent facility, then the trap or pond shall be enlarged to comply with the surface area requirement. The permanent pond shall also be divided into two cells as required for sediment ponds.

Either a permanent control structure or the temporary control structure (described in BMP C241, Temporary Sediment Pond) can be used. If a permanent control structure is used, it may be advisable to partially restrict the lower orifice with gravel to increase residence time while still allowing dewatering of the pond. A shut-off valve may be added to the control structure to allow complete retention of stormwater in emergency situations. In this case, an emergency overflow weir must be added.

A skimmer may be used for the sediment trap outlet if approved by the Local Permitting Authority.

Design and Installation Specifications

- See Figures 4.2.16 and 4.2.17 for details.
- If permanent runoff control facilities are part of the project, they should be used for sediment retention.
- To determine the sediment trap geometry, first calculate the design surface area (SA) of the trap, measured at the invert of the weir. Use the following equation:

  $SA = FS(Q_2/V_S)$

  where

  Q_2 = Design inflow based on the peak discharge from the developed 2-year runoff event from the contributing drainage area as computed in the hydrologic analysis. The 10-year peak flow shall be used if the project size, expected timing and duration of construction, or downstream conditions warrant a higher level of protection. If no hydrologic analysis is required, the Rational Method may be used.

  V_S = The settling velocity of the soil particle of interest. The 0.02 mm (medium silt) particle with an assumed density of 2.65 g/cm^3 has been selected as the particle of interest and has a settling velocity (V_S) of 0.00096 ft/sec.

  FS = A safety factor of 2 to account for non-ideal settling.

  Therefore, the equation for computing surface area becomes:

  $SA = 2 \times Q_2/0.00096$ or

  2080 square feet per cfs of inflow

  Note: Even if permanent facilities are used, they must still have a surface area that is at least as large as that derived from the above formula. If they do not, the pond must be enlarged.

- To aid in determining sediment depth, all sediment traps shall have a staff gauge with a prominent mark 1-foot above the bottom of the trap.

- Sediment traps may not be feasible on utility projects due to the limited work space or the short-term nature of the work. Portable tanks may be used in place of sediment traps for utility projects.

Maintenance Standards

- Sediment shall be removed from the trap when it reaches 1-foot in depth.
- Any damage to the pond embankments or slopes shall be repaired.

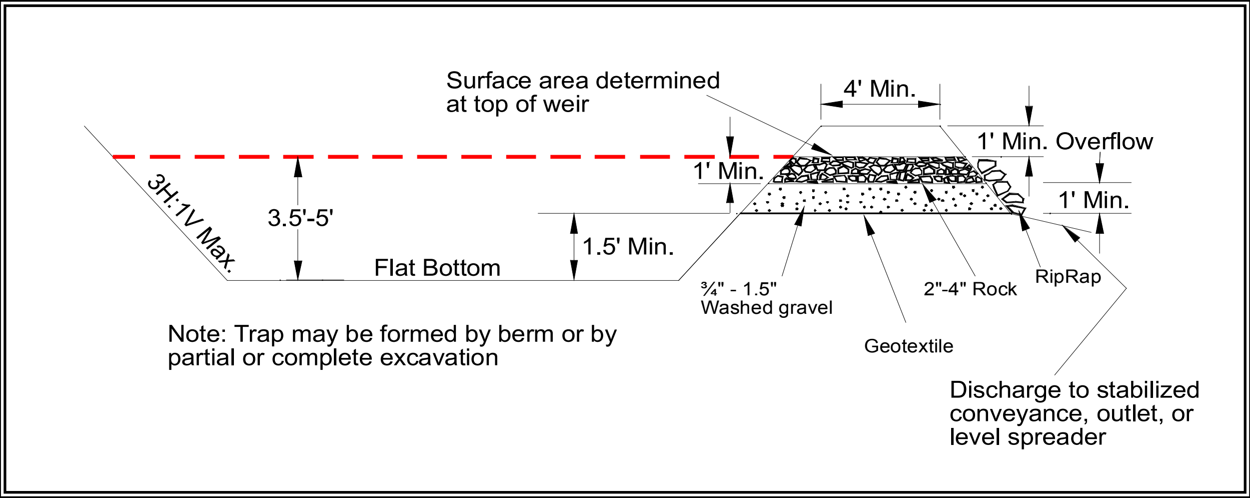


Figure 4.2.16 – Cross Section of Sediment Trap

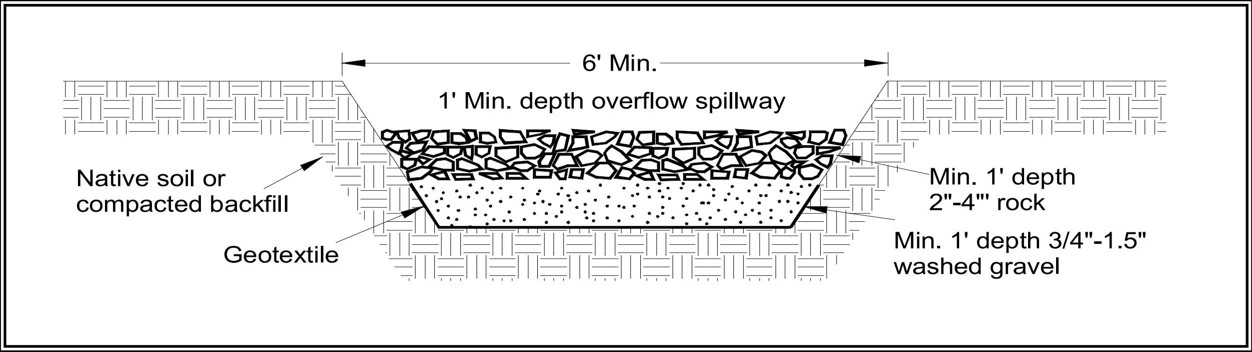


Figure 4.2.17 – Sediment Trap Outlet

BMP C241: Temporary Sediment Pond

Purpose

Sediment ponds remove sediment from runoff originating from disturbed areas of the site. Sediment ponds are typically designed to remove sediment no smaller than medium silt (0.02 mm). Consequently, they usually reduce turbidity only slightly.

Conditions of Use

Prior to leaving a construction site, stormwater runoff must pass through a sediment pond or other appropriate sediment removal best management practice.

A sediment pond shall be used where the contributing drainage area is 3 acres or more. Ponds must be used in conjunction with erosion control practices to reduce the amount of sediment flowing into the basin.

Design and Installation Specifications

- Sediment basins must be installed only on sites where failure of the structure would not result in loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities. Also, sediment traps and ponds are attractive to children and can be very dangerous. Compliance with local ordinances regarding health and safety must be addressed. If fencing of the pond is required, the type of fence and its location shall be shown on the ESC plan.
- Structures having a maximum storage capacity at the top of the dam of 10 acre-ft (435,600 ft^3) or more are subject to the Washington Dam Safety Regulations (Chapter 173-175 WAC).
- See Figures 4.2.18, 4.2.19, and 4.2.20 for details.
- If permanent runoff control facilities are part of the project, they should be used for sediment retention. The surface area requirements of the sediment basin must be met. This may require temporarily enlarging the permanent basin to comply with the surface area requirements. The permanent control structure must be temporarily replaced with a control structure that only allows water to leave the pond from the surface or by pumping. The permanent control structure must be installed after the site is fully stabilized. .
- Use of infiltration facilities for sedimentation basins during construction tends to clog the soils and reduce their capacity to infiltrate. If infiltration facilities are to be used, the sides and bottom of the facility must only be rough excavated to a minimum of 2 feet above final grade. Final grading of the infiltration facility shall occur only when all contributing drainage areas are fully stabilized. The infiltration pretreatment facility should be fully constructed and used with the sedimentation basin to help prevent clogging.
- Determining Pond Geometry

  Obtain the discharge from the hydrologic calculations of the peak flow for the 2-year runoff event (Q_2). The 10-year peak flow shall be used if the project size, expected timing and duration of construction, or downstream conditions warrant a higher level of protection. If no hydrologic analysis is required, the Rational Method may be used.

Determine the required surface area at the top of the riser pipe with the equation:

$SA = 2 \times Q_2/0.00096$ or
2080 square feet per cfs of inflow

See BMP C240 for more information on the derivation of the surface area calculation.

The basic geometry of the pond can now be determined using the following design criteria:

- Required surface area SA (from Step 2 above) at top of riser.
- Minimum 3.5-foot depth from top of riser to bottom of pond.
- Maximum 3H:1V interior side slopes and maximum 2H:1V exterior slopes. The interior slopes can be increased to a maximum of 2H:1V if fencing is provided at or above the maximum water surface.
- One foot of freeboard between the top of the riser and the crest of the emergency spillway.
- Flat bottom.
- Minimum 1-foot deep spillway.
- Length-to-width ratio between 3:1 and 6:1.
- Sizing of Discharge Mechanisms.

The outlet for the basin consists of a combination of principal and emergency spillways. These outlets must pass the peak runoff expected from the contributing drainage area for a 100-year storm. If, due to site conditions and basin geometry, a separate emergency spill-way is not feasible, the principal spillway must pass the entire peak runoff expected from the 100-year storm. However, an attempt to provide a separate emergency spillway should always be made. The runoff calculations should be based on the site conditions during construction. The flow through the dewatering orifice cannot be utilized when calculating the 100-year storm elevation because of its potential to become clogged; therefore, available spillway storage must begin at the principal spillway riser crest.

The principal spillway designed by the procedures contained in this standard will result in some reduction in the peak rate of runoff. However, the riser outlet design will not adequately control the basin discharge to the predevelopment discharge limitations as stated in Minimum Requirement #7: Flow Control. However, if the basin for a permanent stormwater detention pond is used for a temporary sedimentation basin, the control structure for the permanent pond can be used to maintain predevelopment discharge limitations. The size of the basin, the expected life of the construction project, the anticipated downstream effects and the anticipated weather conditions during construction, should be considered to determine the need of additional discharge control. See Figure 4.2.21 for riser inflow curves.

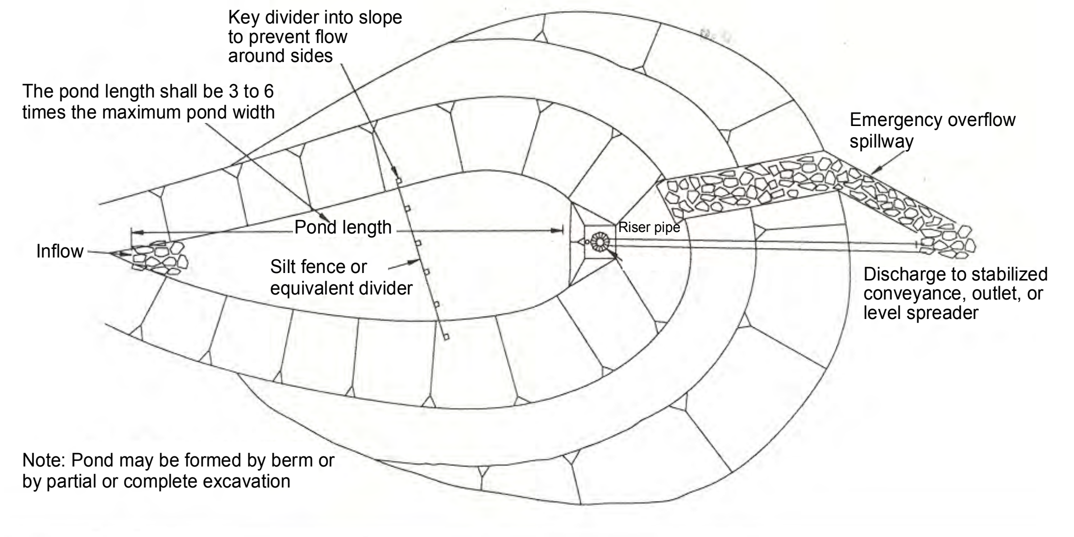


Figure 4.2.18 – Sediment Pond Plan View

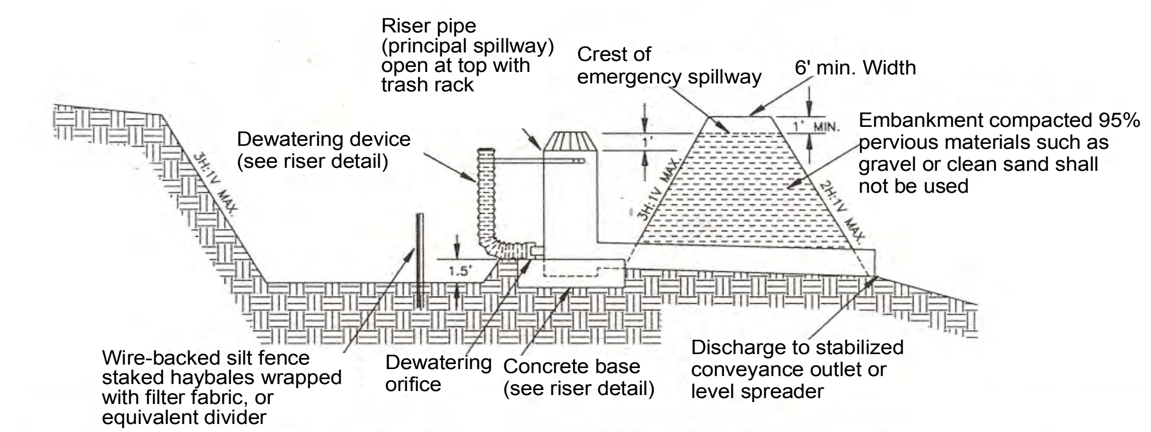


Figure 4.2.19 – Sediment Pond Cross Section

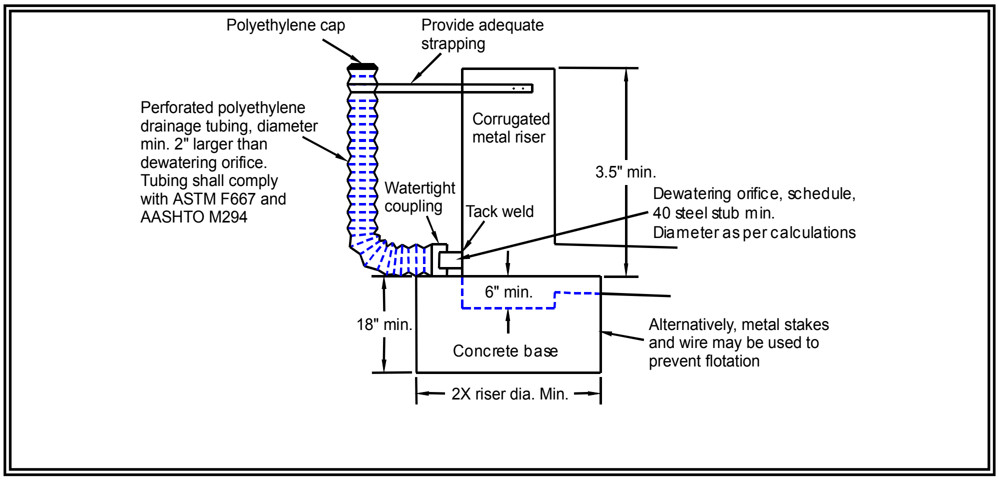


Figure 4.2.20 – Sediment Pond Riser Detail

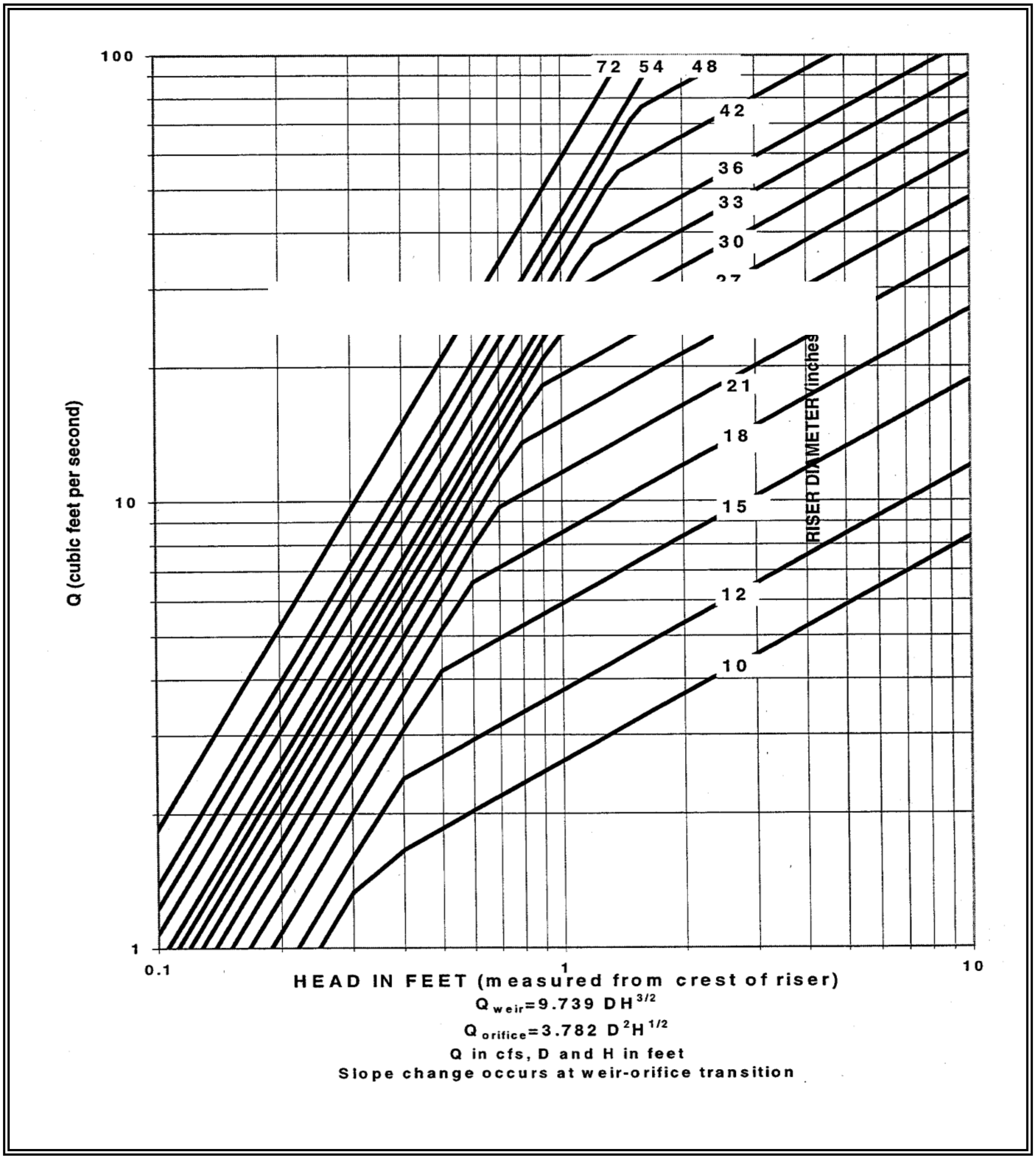


Figure 4.2.21 – Riser Inflow Curves

Principal Spillway: Determine the required diameter for the principal spillway (riser pipe). The diameter shall be the minimum necessary to pass the site's 15-minute, 10-year flowrate. If using the Western Washington Hydrology Model (WWHM), Version 2 or 3, design flow is the 10-year (1 hour) flow for the developed (unmitigated) site, multiplied by a factor of 1.6. Use Figure 4.2.21 to determine this diameter (h = 1-foot). *Note: A permanent control structure may be used instead of a temporary riser.*

Emergency Overflow Spillway: Determine the required size and design of the emergency overflow spillway for the developed 100-year peak flow using the method contained in Volume III.

Dewatering Orifice: Determine the size of the dewatering orifice(s) (minimum 1-inch diameter) using a modified version of the discharge equation for a vertical orifice and a basic equation for the area of a circular orifice. Determine the required area of the orifice with the following equation:

$$A_o = \frac{A_s (2h)^{0.5}}{0.6\text{x}3600Tg^{0.5}}$$

where	A_O	=	orifice area (square feet)
	A_S	=	pond surface area (square feet)
	h	=	head of water above orifice (height of riser in feet)
	T	=	dewatering time (24 hours)
	g	=	acceleration of gravity (32.2 feet/second^2)

Convert the required surface area to the required diameter D of the orifice:

$$D = 24\text{x}\sqrt{\frac{A_o}{\pi}} = 13.54\text{x}\sqrt{A_o}$$

The vertical, perforated tubing connected to the dewatering orifice must be at least 2 inches larger in diameter than the orifice to improve flow characteristics. The size and number of perforations in the tubing should be large enough so that the tubing does not restrict flow. The orifice should control the flow rate.

- Additional Design Specifications

  The pond shall be divided into two roughly equal volume cells by a permeable divider that will reduce turbulence while allowing movement of water between cells. The divider shall be at least one-half the height of the riser and a minimum of one foot below the top of the riser. Wire-backed, 2- to 3-foot high, extra strength filter fabric supported by treated 4"x4"s can be used as a divider. Alternatively, staked straw bales wrapped with filter fabric (geotextile) may be used. If the pond is more than 6 feet deep, a different mechanism must be proposed. A riprap embankment is one acceptable method of separation for deeper ponds. Other designs that satisfy the intent of this provision are allowed as long as the divider is permeable, structurally sound, and designed to prevent erosion under or around the barrier.

To aid in determining sediment depth, one-foot intervals shall be prominently marked on the riser.

If an embankment of more than 6 feet is proposed, the pond must comply with the criteria contained in Volume III regarding dam safety for detention BMPs.

- The most common structural failure of sedimentation basins is caused by piping. Piping refers to two phenomena: (1) water seeping through fine-grained soil, eroding the soil grain by grain and forming pipes or tunnels; and, (2) water under pressure flowing upward through a granular soil with a head of sufficient magnitude to cause soil grains to lose contact and capability for support.

  The most critical construction sequences to prevent piping will be:

  1. Tight connections between riser and barrel and other pipe connections.
  2. Adequate anchoring of riser.
  3. Proper soil compaction of the embankment and riser footing.
  4. Proper construction of anti-seep devices.

Maintenance Standards

- Sediment shall be removed from the pond when it reaches 1–foot in depth.
- Any damage to the pond embankments or slopes shall be repaired.

BMP C250: Construction Stormwater Chemical Treatment

Purpose

This BMP applies when using stormwater chemicals in batch treatment or flow-through treatment.

Turbidity is difficult to control once fine particles are suspended in stormwater runoff from a construction site. Sedimentation ponds are effective at removing larger particulate matter by gravity settling, but are ineffective at removing smaller particulates such as clay and fine silt. Traditional erosion and sediment control BMPs may not be adequate to ensure compliance with the water quality standards for turbidity in receiving water.

Chemical treatment can reliably provide exceptional reductions of turbidity and associated pollutants. Chemical treatment may be required to meet turbidity stormwater discharge requirements, especially when construction is to proceed through the wet season.

Conditions of Use

Formal written approval from Ecology is required for the use of chemical treatment regardless of site size. The Local Permitting Authority may also

Operator Training: Each contractor who intends to use chemical treatment shall be trained by an experienced contractor . Each site using chemical treatment must have an operator trained and certified by an organization approved by Ecology.

Standard BMPs: Surface stabilization BMPs should be implemented on site to prevent significant erosion. All sites shall use a truck wheel wash to prevent tracking of sediment off site.

Sediment Removal and Disposal:

- Sediment shall be removed from the storage or treatment cells as necessary. Typically, sediment removal is required at least once during a wet season and at the decommissioning of the cells. Sediment remaining in the cells between batches may enhance the settling process and reduce the required chemical dosage.
- Sediment that is known to be non-toxic may be incorporated into the site away from drainages.

BMP C251: Construction Stormwater Filtration

Purpose

Filtration removes sediment from runoff originating from disturbed areas of the site.

Background Information:

Filtration with sand media has been used for over a century to treat water and wastewater. The use of sand filtration for treatment of stormwater has developed recently, generally to treat runoff from streets, parking lots, and residential areas. The application of filtration to construction stormwater treatment is currently under development.

Conditions of Use

Traditional BMPs used to control soil erosion and sediment loss from sites under development may not be adequate to ensure compliance with the water quality standard for turbidity in the receiving water. Filtration may be used in conjunction with gravity settling to remove sediment as small as fine silt (0.5 µm). The reduction in turbidity will be dependent on the particle size distribution of the sediment in the stormwater. In some circumstances, sedimentation and filtration may achieve compliance with the water quality standard for turbidity.

The use of construction stormwater filtration does not require approval from Ecology as long as treatment chemicals are not used. Filtration in conjunction with polymer treatment requires testing under the Chemical Technology Assessment Protocol – Ecology (CTAPE) before it can be initiated. Approval from the appropriate regional Ecology office must be obtained at each site where polymers use is proposed prior to use. For more guidance on stormwater chemical treatment see BMP C250.

Design and Installation Specifications

Two types of filtration systems may be applied to construction stormwater treatment: rapid and slow. Rapid sand filters are the typical system used for water and wastewater treatment. They can achieve relatively high hydraulic flow rates, on the order of 2 to 20 gpm/sf, because they have automatic backwash systems to remove accumulated solids. In contrast, slow sand filters have very low hydraulic rates, on the order of 0.02 gpm/sf, because they do not have backwash systems. Slow sand filtration has generally been used to treat stormwater. Slow sand filtration is mechanically simple in comparison to rapid sand filtration but requires a much larger filter area.

Filtration Equipment. Sand media filters are available with automatic backwashing features that can filter to 50 µm particle size. Screen or bag filters can filter down to 5 µm. Fiber wound filters can remove particles down to 0.5 µm. Filters should be sequenced from the largest to the smallest pore opening. Sediment removal efficiency will be related to particle size distribution in the stormwater.

Treatment Process Description. Stormwater is collected at interception point(s) on the site and is diverted to an untreated stormwater sediment pond or tank for removal of large sediment and storage of the stormwater before it is treated by the filtration system. The untreated stormwater is pumped from the trap, pond, or tank through the filtration system in a rapid sand filtration system. Slow sand filtration systems are designed as flow through systems using gravity.

Maintenance Standards

Rapid sand filters typically have automatic backwash systems that are triggered by a pre-set pressure drop across the filter. If the backwash water volume is not large or substantially more turbid than the untreated stormwater stored in the holding pond or tank, backwash return to the untreated stormwater pond or tank may be appropriate. However, other means of treatment and disposal may be necessary.

- Screen, bag, and fiber filters must be cleaned and/or replaced when they become clogged.
- Sediment shall be removed from the storage and/or treatment ponds as necessary. Typically, sediment removal is required once or twice during a wet season and at the decommissioning of the ponds.

Sizing Criteria for Flow-Through Treatment Systems for Flow Control Exempt Water Bodies:

When sizing storage ponds or tanks for flow-through systems for flow control exempt water bodies the treatment system capacity should be a factor. The untreated stormwater storage pond or tank should be sized to hold 1.5 times the runoff volume of the 10-year, 24-hour storm event minus the treatment system flowrate for an 8-hour period. For a chitosan-enhanced sand filtration system, the treatment system flowrate should be sized using a hydraulic loading rate between 6-8 gpm/ft^2. Other hydraulic loading rates may be more appropriate for other systems. Bypass should be provided around the chemical treatment system to accommodate extreme storms. Runoff volume shall be calculated using the methods presented in Volume 3, Chapter 2. Worst-case conditions (i.e., producing the most runoff) should be used for analyses (most likely conditions present prior to final landscaping).

Sizing Criteria for Flow Control Water Bodies:

Sites that must implement flow control for the developed site condition must also control stormwater release rates during construction. Construction site stormwater discharges shall not exceed the discharge durations of the pre-developed condition for the range of pre-developed discharge rates from 1/2 of the 2-year flow through the 10-year flow as predicted by an approved continuous runoff model. The pre-developed condition to be matched shall be the land cover condition immediately prior to the development project. This restriction on release rates can affect the size of the storage pond, the filtration system, and the flow rate through the filter system.

The following is how WWHM can be used to determine the release rates from the filtration systems:

1. Determine the pre-developed flow durations to be matched by entering the land use area under the "Pre-developed" scenario in WWHM. The default flow range is from ½ of the 2-year flow through the 10-year flow.
2. Enter the post developed land use area in the "Developed Unmitigated" scenario in WWHM.
3. Copy the land use information from the "Developed Unmitigated" to "Developed Mitigated" scenario.
4. There are two possible ways to model stormwater filtration systems:
    a. The stormwater filtration system uses an untreated stormwater storage pond/tank and the discharge from this pond/tank is pumped to one or more filters. In-line filtration chemicals would be added to the flow right after the pond/tank and before the filter(s). Because the discharge is pumped, WWHM can't generate a stage/storage /discharge (SSD) table for this system. This system is modeled the same way as described in BMP C250 and is as follows:

       While in the "Developed Mitigated" scenario, add a pond element under the basin element containing the post-developed land use areas. This pond element represents information on the available untreated stormwater storage and discharge from the filtration system. In cases where the discharge from the filtration system is controlled by a pump, a stage/storage/discharge (SSD) table representing the pond must be generated outside WWHM and imported into WWHM. WWHM can route the runoff from the post-developed condition through this SSD table (the pond) and determine compliance with the flow duration standard. This would be an iterative design procedure where if the initial SSD table proved to be out of compliance, the designer would have to modify the SSD table outside WWHM and re-import in WWHM and route the runoff through it again. The iteration will continue until a pond that enables compliance with the flow duration standard is designed.

Notes on SSD table characteristics:

- The pump discharge rate would likely be initially set at just below ½ if the 2-year flow from the pre-developed condition. As runoff coming into the untreated stormwater storage pond increases and the available untreated stormwater storage volume gets used up, it would be necessary to increase the pump discharge rate above ½ of the 2-year. The increase(s) above ½ of the 2-year must be such that they provide some relief to the untreated stormwater storage needs but at the same time they will not cause violations of the flow duration standard at the higher flows. The final design SSD table will identify the appropriate pumping rates and the corresponding stage and storages.
- When building such a flow control system, the design must ensure that any automatic adjustments to the pumping rates will be as a result of changes to the available storage in accordance with the final design SSD table.

b. The stormwater filtration system uses a storage pond/tank and the discharge from this pond/tank gravity flows to the filter. This is usually a slow sand filter system and it is possible to model it in WWHM as a Filter element or as a combination of Pond and Filter element placed in series. The stage/storage/discharge table(s) may then be generated within WWHM as follows:

(i) While in the "Developed Mitigated" scenario, add a Filter element under the basin element containing the post-developed land use areas. The length and width of this filter element would have to be the same as the bottom length and width of the upstream untreated stormwater storage pond/tank.

(ii) In cases where the length and width of the filter is not the same as those for the bottom of the upstream untreated stormwater storage tank/pond, the treatment system may be modeled as a Pond element followed by a Filter element. By having these two elements, WWHM would then generate a SSD table for the storage pond which then gravity flows to the Filter element. The Filter element downstream of the untreated stormwater storage pond would have a storage component through the media, and an overflow component for when the filtration capacity is exceeded.

WWHM can route the runoff from the post-developed condition through the treatment systems in 4b and determine compliance with the flow duration standard. This would be an iterative design procedure where if the initial sizing estimates for the treatment system proved to be inadequate, the designer would have to modify the system and route the runoff through it again. The iteration would continue until compliance with the flow duration standard is achieved.

5. It should be noted that the above procedures would be used to meet the flow control requirements. The filtration system must be able to meet the runoff treatment requirements. It is likely that the discharge flow rate of ½ of the 2-year or more may exceed the treatment capacity of the system. If that is the case, the untreated stormwater discharge rate(s) (i.e., influent to the treatment system) must be reduced to allow proper treatment. Any reduction in the flows would likely result in the need for a larger untreated stormwater storage volume.

If system design does not allow you to discharge at the slower rates as described above and if the site has a retention or detention pond that will serve the planned development, the discharge from the treatment system may be directed to the permanent retention/detention pond to comply with the flow control requirements. In this case, the untreated stormwater storage pond and treatment system will be sized according to the sizing criteria for flow-through treatment systems for flow control exempt waterbodies described earlier except all discharges (water passing through the treatment system and stormwater bypassing the treatment system) will be directed into the permanent retention/detention pond. If site constraints make locating the untreated stormwater storage pond difficult, the permanent retention/detention pond may be divided to serve as the untreated stormwater discharge pond and the post-treatment flow control pond. A berm or barrier must be used in this case so the untreated water does not mix with the treated water. Both untreated stormwater storage requirements, and adequate post-treatment flow control must be achieved. The post-treatment flow control pond's revised dimensions must be entered into the WWHM and the WWHM must be run to confirm compliance with the flow control requirement.

Appendix D – General Permit

Issuance Date:	December 1, 2010
Effective Date:	January 1, 2011
Expiration Date:	December 31, 2015

CONSTRUCTION STORMWATER GENERAL PERMIT

National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit for Stormwater Discharges Associated with Construction Activity

State of Washington
Department of Ecology
Olympia, Washington 98504

In compliance with the provisions of
Chapter 90.48 Revised Code of Washington
(State of Washington Water Pollution Control Act)
and
Title 33 United States Code, Section 1251 et seq.
The Federal Water Pollution Control Act (The Clean Water Act)

Until this permit expires, is modified or revoked, Permittees that have properly obtained coverage under this general permit are authorized to discharge in accordance with the special and general conditions that follow.

Kelly Susewind, P.E., P.G.
Water Quality Program Manager
Washington State Department of Ecology

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SUMMARY OF PERMIT REPORT SUBMITTALS

Refer to the Special and General Conditions within this permit for additional submittal requirements. Appendix A provides a list of definitions. Appendix B provides a list of acronyms.

Table 1. Summary of Permit Report Submittals

Permit Section	Submittal	Frequency	First Submittal Date
S5.A and S8	High Turbidity/Transparency Phone Reporting	As Necessary	Within 24 hours
S5.B	Discharge Monitoring Report	Monthly*	Within 15 days of applicable monitoring period
S5.F and S8	Noncompliance Notification	As necessary	Immediately
S5.F	Noncompliance Notification – Written Report	As necessary	Within 5 Days of non-compliance
G2.	Notice of Change in Authorization	As necessary	
G6.	Permit Application for Substantive Changes to the Discharge	As necessary	
G8.	Application for Permit Renewal	1/permit cycle	No later than 180 days before expiration
G9.	Notice of Permit Transfer	As necessary	
G20.	Notice of Planned Changes	As necessary	
G22.	Reporting Anticipated Non-compliance	As necessary	

SPECIAL NOTE: *Permittees must submit Discharge Monitoring Reports (DMRs) to the Washington State Department of Ecology monthly, regardless of site discharge, for the full duration of permit coverage. Refer to Section S5.B of this General Permit for more specific information regarding DMRs.

Table 2. Summary of Required On-site Documentation

Document Title	Permit Conditions
Permit Coverage Letter	See Conditions S2, S5
Construction Stormwater General Permit	See Conditions S2, S5
Site Log Book	See Conditions S4, S5
Stormwater Pollution Prevention Plan (SWPPP)	See Conditions S9, S5

SPECIAL CONDITIONS

S1. PERMIT COVERAGE

A. Permit Area

This Construction Stormwater General Permit (CSWGP) covers all areas of Washington State, except for federal and Tribal lands as specified in Special Condition S1.E.3.

B. Operators Required to Seek Coverage Under this General Permit:

1. Operators of the following construction activities are required to seek coverage under this CSWGP:

   a. Clearing, grading and/or excavation that results in the disturbance of one or more acres and discharges stormwater to surface waters of the State; and clearing, grading and/or excavation on sites smaller than one acre that are part of a larger common plan of development or sale, if the common plan of development or sale will ultimately disturb one acre or more and discharge stormwater to surface waters of the State.

      i. This includes forest practices (including, but not limited to, class IV conversions) that are part of a construction activity that will result in the disturbance of one or more acres, and discharge to surface waters of the State (that is, forest practices that prepare a site for construction activities); and

   b. Any size construction activity discharging stormwater to waters of the State that the Department of Ecology (―Ecology”):

      i. Determines to be a significant contributor of pollutants to waters of the State of Washington.

      ii. Reasonably expects to cause a violation of any water quality standard.

2. Operators of the following activities are not required to seek coverage under this CSWGP (unless specifically required under Special Condition S1.B.1.b. above):

   a. Construction activities that discharge all stormwater and non-stormwater to ground water, sanitary sewer, or combined sewer, and have no point source discharge to either surface water or a storm sewer system that drains to surface waters of the State.

   b. Construction activities covered under an Erosivity Waiver (Special Condition S2.C).

   c. Routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

C. Authorized Discharges:

1. Stormwater Associated with Construction Activity. Subject to compliance with the terms and conditions of this permit, Permittees are authorized to discharge stormwater associated with construction activity to surface waters of the State or to a storm sewer system that drains to surface waters of the State. (Note that –surface waters of the State" may exist on a construction site as well as off site; for example, a creek running through a site.)

2. Stormwater Associated with Construction Support Activity. This permit also authorizes stormwater discharge from support activities related to the permitted construction site (for example, an on-site portable rock crusher, off-site equipment staging yards, material storage areas, borrow areas, etc.) provided:

   a. The support activity relates directly to the permitted construction site that is required to have a NPDES permit; and

   b. The support activity is not a commercial operation serving multiple unrelated construction projects, and does not operate beyond the completion of the construction activity; and

   c. Appropriate controls and measures are identified in the Stormwater Pollution Prevention Plan (SWPPP) for the discharges from the support activity areas.

3. Non-Stormwater Discharges. The categories and sources of non-stormwater discharges identified below are authorized conditionally, provided the discharge is consistent with the terms and conditions of this permit:

   a. Discharges from fire-fighting activities.

   b. Fire hydrant system flushing.

   c. Potable water, including uncontaminated water line flushing.

   d. Pipeline hydrostatic test water.

   e. Uncontaminated air conditioning or compressor condensate.

   f. Uncontaminated ground water or spring water.

   g. Uncontaminated excavation dewatering water (in accordance with S9.D.10).

   h. Uncontaminated discharges from foundation or footing drains.

   i. Water used to control dust. Permittees must minimize the amount of dust control water used.

   j. Routine external building wash down that does not use detergents.

   k. Landscape irrigation water.

   The SWPPP must adequately address all authorized non-stormwater discharges, except for discharges from fire-fighting activities, and must comply with Special

Condition S3. At a minimum, discharges from potable water (including water line flushing), fire hydrant system flushing, and pipeline hydrostatic test water must undergo the following: dechlorination to a concentration of 0.1 parts per million (ppm) or less, and pH adjustment to within 6.5 – 8.5 standard units (su), if necessary.

D. Prohibited Discharges:

The following discharges to waters of the State, including ground water, are prohibited.

1. Concrete wastewater.

2. Wastewater from washout and clean-up of stucco, paint, form release oils, curing compounds and other construction materials.

3. Process wastewater as defined by 40 Code of Federal Regulations (CFR) 122.1 (see Appendix A of this permit).

4. Slurry materials and waste from shaft drilling.

5. Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance.

6. Soaps or solvents used in vehicle and equipment washing.

7. Wheel wash wastewater, unless discharged according to Special Condition S9.D.9.d.

8. Discharges from dewatering activities, including discharges from dewatering of trenches and excavations, unless managed according to Special Condition S9.D.10.

E. Limits on Coverage

Ecology may require any discharger to apply for and obtain coverage under an individual permit or another more specific general permit. Such alternative coverage will be required when Ecology determines that this CSWGP does not provide adequate assurance that water quality will be protected, or there is a reasonable potential for the project to cause or contribute to a violation of water quality standards.

The following stormwater discharges are not covered by this permit:

1. Post-construction stormwater discharges that originate from the site after completion of construction activities and the site has undergone final stabilization.

2. Non-point source silvicultural activities such as nursery operations, site preparation, reforestation and subsequent cultural treatment, thinning, prescribed burning, pest and fire control, harvesting operations, surface drainage, or road construction and maintenance, from which there is natural runoff as excluded in 40 CFR Subpart 122.

3. Stormwater from any federal project or project on federal land or land within an Indian Reservation except for the Puyallup Reservation. Within the Puyallup

Reservation, any project that discharges to surface water on land held in trust by the federal government may be covered by this permit.

4. Stormwater from any site covered under an existing NPDES individual permit in which stormwater management and/or treatment requirements are included for all stormwater discharges associated with construction activity.

5. Stormwater from a site where an applicable Total Maximum Daily Load (TMDL) requirement specifically precludes or prohibits discharges from construction activity.

S2. APPLICATION REQUIREMENTS

A. Permit Application Forms

1. Notice of Intent Form/Timeline

a. Operators of new or previously unpermitted construction activities must submit a complete and accurate permit application (Notice of Intent, or NOI) to Ecology.

b. The operator must submit the NOI at least 60 days before discharging stormwater from construction activities and must submit it on or before the date of the first public notice (see Special Condition S2.B below for details). The 30-day public comment period required by WAC 173-226-130(5) begins on the publication date of the second public notice. Unless Ecology responds to the complete application in writing, based on public comments, or any other relevant factors, coverage under the general permit will automatically commence on the thirty-first day following receipt by Ecology of a completed NOI, or the issuance date of this permit, whichever is later, unless Ecology specifies a later date in writing.

c. Applicants who propose to discharge to a storm or sewer system operated by Seattle, King County, Snohomish County, Tacoma, Pierce County, or Clark County must also submit a copy of the NOI to the appropriate jurisdiction.

d. If an applicant intends to use a Best Management Practice (BMP) selected on the basis of Special Condition S9.C.4 (―demonstrably equivalent" BMPs), the applicant must notify Ecology of its selection as part of the NOI. In the event the applicant selects BMPs after submission of the NOI, it must provide notice of the selection of an equivalent BMP to Ecology at least 60 days before intended use of the equivalent BMP.

e. Permittees must notify Ecology regarding any changes to the information provided on the NOI by submitting an updated NOI. Examples of such changes include, but are not limited to,

i. changes to the Permittee's mailing address,

ii. changes to the on-site contact person information, and

iii. changes to the area/acreage affected by construction activity.

2. Transfer of Coverage Form

The Permittee can transfer current coverage under this permit to one or more new operators, including operators of sites within a Common Plan of Development, provided the Permittee submits a Transfer of Coverage Form in accordance with General Condition G9. Transfers do not require public notice.

B. Public Notice

For new or previously unpermitted construction activities, the applicant must publish a public notice at least one time each week for two consecutive weeks, at least 7 days apart, in a newspaper with general circulation in the county where the construction is to take place. The notice must contain:

1. A statement that ―The applicant is seeking coverage under the Washington State Department of Ecology's Construction Stormwater NPDES and State Waste Discharge General Permit."
2. The name, address and location of the construction site.
3. The name and address of the applicant.
4. The type of construction activity that will result in a discharge (for example, residential construction, commercial construction, etc.), and the number of acres to be disturbed.
5. The name of the receiving water(s) (that is, the surface water(s) to which the site will discharge), or, if the discharge is through a storm sewer system, the name of the operator of the system.
6. The statement: "Any persons desiring to present their views to the Washington State Department of Ecology regarding this application, or interested in Ecology's action on this application, may notify Ecology in writing no later than 30 days of the last date of publication of this notice. Ecology reviews public comments and considers whether discharges from this project would cause a measurable change in receiving water quality, and, if so, whether the project is necessary and in the overriding public interest according to Tier II antidegradation requirements under WAC 173-201A-320. Comments can be submitted to: Department of Ecology, P.O. Box 47696, Olympia, WA 98504-7696 Attn: Water Quality Program, Construction Stormwater."

C. Erosivity Waiver

Construction site operators may qualify for an erosivity waiver from the CSWGP if the following conditions are met:

1. The site will result in the disturbance of fewer than 5 acres and the site is not a portion of a common plan of development or sale that will disturb 5 acres or greater.

2. Calculation of Erosivity ―R” Factor and Regional Timeframe:

   a. The project's rainfall erosivity factor (―R” Factor) must be less than 5 during the period of construction activity, as calculated using either the Texas A&M University online rainfall erosivity calculator at: http://ei.tamu.edu/ or EPA's calculator at http://cfpub.epa.gov/npdes/stormwater/lew/lewcalculator.cfm. The period of construction activity starts when the land is first disturbed and ends with final stabilization. In addition:

   b. The entire period of construction activity must fall within the following timeframes:

      i. For sites west of the Cascades Crest: June 15 – September 15.

      ii. For sites east of the Cascades Crest, excluding the Central Basin: June 15 – October 15.

      iii. For sites east of the Cascades Crest, within the Central Basin: no additional timeframe restrictions apply. The Central Basin is defined as the portions of Eastern Washington with mean annual precipitation of less than 12 inches. For a map of the Central Basin (Region 2), refer to http://www.ecy.wa.gov/pubs/ecy070202.pdf.

3. Construction site operators must submit a complete Erosivity Waiver certification form at least one week before disturbing the land. Certification must include statements that the operator will:

   a. Comply with applicable local stormwater requirements; and

   b. Implement appropriate erosion and sediment control BMPs to prevent violations of water quality standards.

4. This waiver is not available for facilities declared significant contributors of pollutants as defined in Special Condition S1.B.1.b.

5. This waiver does not apply to construction activities which include non-stormwater discharges listed in Special Condition S1.C.3.

6. If construction activity extends beyond the certified waiver period for any reason, the operator must either:

   a. Recalculate the rainfall erosivity ―R” factor using the original start date and a new projected ending date and, if the ―R” factor is still under 5 and the entire project falls within the applicable regional timeframe in Special Condition S2.C.2.b, complete and submit an amended waiver certification form before the original waiver expires; or

b. Submit a complete permit application to Ecology in accordance with Special Condition S2.A and B before the end of the certified waiver period.

S3. COMPLIANCE WITH STANDARDS

A. Discharges must not cause or contribute to a violation of surface water quality standards (Chapter 173-201A WAC), ground water quality standards (Chapter 173-200 WAC), sediment management standards (Chapter 173-204 WAC), and human health-based criteria in the National Toxics Rule (40 CFR Part 131.36). Discharges not in compliance with these standards are not authorized.

B. Prior to the discharge of stormwater and non-stormwater to waters of the State, the Permittee must apply all known, available, and reasonable methods of prevention, control, and treatment (AKART). This includes the preparation and implementation of an adequate Stormwater Pollution Prevention Plan (SWPPP), with all appropriate BMPs installed and maintained in accordance with the SWPPP and the terms and conditions of this permit.

C. Ecology presumes that a Permittee complies with water quality standards unless discharge monitoring data or other site-specific information demonstrates that a discharge causes or contributes to a violation of water quality standards, when the Permittee complies with the following conditions. The Permittee must fully:

1. Comply with all permit conditions, including planning, sampling, monitoring, reporting, and recordkeeping conditions.

2. Implement stormwater BMPs contained in stormwater management manuals published or approved by Ecology, or BMPs that are demonstrably equivalent to BMPs contained in stormwater technical manuals published or approved by Ecology, including the proper selection, implementation, and maintenance of all applicable and appropriate BMPs for on-site pollution control. (For purposes of this section, the stormwater manuals listed in Appendix 10 of the Phase I Municipal Stormwater Permit are approved by Ecology.)

D. Where construction sites also discharge to ground water, the ground water discharges must also meet the terms and conditions of this CSWGP. Permittees who discharge to ground water through an injection well must also comply with any applicable requirements of the Underground Injection Control (UIC) regulations, Chapter 173-218 WAC.

S4. MONITORING REQUIREMENTS, BENCHMARKS AND REPORTING TRIGGERS

Table 3. Summary of Primary Monitoring Requirements

Size of Soil Disturbance[1]	Weekly Site Inspections	Weekly Sampling w/ Turbidity Meter	Weekly Sampling w/ Transparency Tube	Weekly pH Sampling[2]	Requires CESCL Certification?
Sites that disturb less than 1 acre, but are part of a larger Common Plan of Development	Required	Not Required	Not Required	Not Required	No
Sites that disturb 1 acre or more, but fewer than 5 acres	Required	Sampling Required – either method[3]		Required	Yes
Sites that disturb 5 acres or more	Required	Required	Not Required[4]	Required	Yes

A. Site Log Book

The Permittee must maintain a site log book that contains a record of the implementation of the SWPPP and other permit requirements, including the installation and maintenance of BMPs, site inspections, and stormwater monitoring.

B. Site Inspections

The Permittee's (operator's) site inspections must include all areas disturbed by construction activities, all BMPs, and all stormwater discharge points. (See Special Conditions S4.B.3 and B.4 below for detailed requirements of the Permittee's Certified Erosion and Sediment Control Lead [CESCL]).

[1] Soil disturbance is calculated by adding together all areas affected by construction activity. Construction activity means clearing, grading, excavation, and any other activity that disturbs the surface of the land, including ingress/egress from the site.
[2] If construction activity results in the disturbance of 1 acre or more, and involves significant concrete work (1,000 cubic yards of poured or recycled concrete over the life of a project) or the use of engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD], or fly ash), and stormwater from the affected area drains to surface waters of the State or to a storm sewer stormwater collection system that drains to other surface waters of the State, the Permittee must conduct pH monitoring sampling in accordance with Special Condition S4.D.
[3] Sites with one or more acres, but fewer than 5 acres of soil disturbance, must conduct turbidity or transparency sampling in accordance with Special Condition S4.C.
[4] Sites equal to or greater than 5 acres of soil disturbance must conduct turbidity sampling using a turbidity meter in accordance with Special Condition S4.C.

Construction sites one acre or larger that discharge stormwater to surface waters of the State must have site inspections conducted by a certified CESCL. Sites less than one acre may have a person without CESCL certification conduct inspections; sampling is not required on sites that disturb less than an acre.

1. The Permittee must examine stormwater visually for the presence of suspended sediment, turbidity, discoloration, and oil sheen. The Permittee must evaluate the effectiveness of BMPs and determine if it is necessary to install, maintain, or repair BMPs to improve the quality of stormwater discharges.

   Based on the results of the inspection, the Permittee must correct the problems identified by:

   a. Reviewing the SWPPP for compliance with Special Condition S9 and making appropriate revisions within 7 days of the inspection.

   b. Immediately beginning the process of fully implementing and maintaining appropriate source control and/or treatment BMPs as soon as possible, addressing the problems no later than within 10 days of the inspection. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when an extension is requested by a Permittee within the initial 10-day response period.

   c. Documenting BMP implementation and maintenance in the site log book.

2. The Permittee must inspect all areas disturbed by construction activities, all BMPs, and all stormwater discharge points at least once every calendar week and within 24 hours of any discharge from the site. (For purposes of this condition, individual discharge events that last more than one day do not require daily inspections. For example, if a stormwater pond discharges continuously over the course of a week, only one inspection is required that week.) The Permittee may reduce the inspection frequency for temporarily stabilized, inactive sites to once every calendar month.

3. The Permittee must have staff knowledgeable in the principles and practices of erosion and sediment control. The CESCL (sites one acre or more) or inspector (sites less than one acre) must have the skills to assess the:

   a. Site conditions and construction activities that could impact the quality of stormwater, and

   b. Effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges.

4. The SWPPP must identify the CESCL or inspector, who must be present on site or on-call at all times. The CESCL must obtain this certification through an approved erosion and sediment control training program that meets the minimum training standards established by Ecology (see BMP C160 in the manual referred to in Special Condition S9.C.1 and 2).

5. The Permittee must summarize the results of each inspection in an inspection report or checklist and enter the report/checklist into, or attach it to, the site log book. At a minimum, each inspection report or checklist must include:

   a. Inspection date and time.

   b. Weather information, the general conditions during inspection and the approximate amount of precipitation since the last inspection, and precipitation within the last 24 hours.

   c. A summary or list of all implemented BMPs, including observations of all erosion/sediment control structures or practices.

   d. A description of the locations:

      i. Of BMPs inspected.

      ii. Of BMPs that need maintenance and why.

      iii. Of BMPs that failed to operate as designed or intended, and

      iv. Where additional or different BMPs are needed, and why.

   e. A description of stormwater discharged from the site. The Permittee must note the presence of suspended sediment, turbidity, discoloration, and oil sheen, as applicable.

   f. Any water quality monitoring performed during inspection.

   g. General comments and notes, including a brief description of any BMP repairs, maintenance or installations made following the inspection.

   h. A summary report and a schedule of implementation of the remedial actions that the Permittee plans to take if the site inspection indicates that the site is out of compliance. The remedial actions taken must meet the requirements of the SWPPP and the permit.

   i. The name, title, and signature of the person conducting the site inspection, a phone number or other reliable method to reach this person, and the following statement: ―I certify that this report is true, accurate, and complete to the best of my knowledge and belief."

C. Turbidity/Transparency Sampling Requirements

1. Sampling Methods

   a. If construction activity involves the disturbance of 5 acres or more, the Permittee must conduct turbidity sampling per Special Condition S4.C.

   b. If construction activity involves 1 acre or more but fewer than 5 acres of soil disturbance, the Permittee must conduct either transparency sampling **or** turbidity sampling per Special Condition S4.C.

2. Sampling Frequency

   a. The Permittee must sample all discharge locations at least once every calendar week when stormwater (or authorized non-stormwater) discharges from the site or enters any on-site surface waters of the state (for example, a creek running through a site).

   b. Samples must be representative of the flow and characteristics of the discharge.

   c. Sampling is not required when there is no discharge during a calendar week.

   d. Sampling is not required outside of normal working hours or during unsafe conditions.

   e. If the Permittee is unable to sample during a monitoring period, the Permittee must include a brief explanation in the monthly Discharge Monitoring Report (DMR).

   f. Sampling is not required before construction activity begins.

3. Sampling Locations

   a. Sampling is required at all points where stormwater associated with construction activity (or authorized non-stormwater) is discharged off site, including where it enters any on-site surface waters of the state (for example, a creek running through a site).

   b. The Permittee may discontinue sampling at discharge points that drain areas of the project that are fully stabilized to prevent erosion.

   c. The Permittee must identify all sampling point(s) on the SWPPP site map and clearly mark these points in the field with a flag, tape, stake or other visible marker.

   d. Sampling is not required for discharge that is sent directly to sanitary or combined sewer systems.

4. Sampling and Analysis Methods

   a. The Permittee performs turbidity analysis with a calibrated turbidity meter (turbidimeter) either on site or at an accredited lab. The Permittee must record the results in the site log book in nephelometric turbidity units (NTU).

   b. The Permittee performs transparency analysis on site with a 1¾-inch-diameter, 60-centimeter (cm)-long transparency tube. The Permittee will record the results in the site log book in centimeters (cm). Transparency tubes are available from: http://watermonitoringequip.com/pages/stream.html.

Table 4. Monitoring and Reporting Requirements

Parameter	Unit	Analytical Method	Sampling Frequency	Benchmark Value	Phone Reporting Trigger Value
Turbidity	NTU	SM2130 or EPA 180.1	Weekly, if discharging	25 NTU	250 NTU
Transparency	cm	Manufacturer instructions, or Ecology guidance	Weekly, if discharging	33 cm	6 cm

5. Turbidity/Transparency Benchmark Values and Reporting Triggers

The benchmark value for turbidity is 25 NTU or less. The benchmark value for transparency is 33 centimeters (cm). Note: Benchmark values do not apply to discharges to segments of water bodies on Washington State's 303(d) list (Category 5) for turbidity, fine sediment, or phosphorus; these discharges are subject to a numeric effluent limit for turbidity. Refer to Special Condition S8 for more information.

a. <u>Turbidity 26 – 249 NTU, or Transparency 32 – 7 cm:</u>

If the discharge turbidity is 26 to 249 NTU; or if discharge transparency is less than 33 cm, but equal to or greater than 6 cm, the Permittee must:

i. Review the SWPPP for compliance with Special Condition S9 and make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.

ii. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible, addressing the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.

iii. Document BMP implementation and maintenance in the site log book.

b. <u>Turbidity 250 NTU or greater, or Transparency 6 cm or less</u>:

If a discharge point's turbidity is 250 NTU or greater, or if discharge transparency is less than or equal to 6 cm, the Permittee must complete the reporting and adaptive management process described below.

i. Telephone the applicable Ecology Region's Environmental Report Tracking System (ERTS) number within 24 hours, in accordance with Special Condition S5.F.

- <u>Central Region</u> (Okanogan, Chelan, Douglas, Kittitas, Yakima, Klickitat, Benton): (509) 575-2490

- Eastern Region (Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman): (509) 329-3400
- Northwest Region (Kitsap, Snohomish, Island, King, San Juan, Skagit, Whatcom): (425) 649-7000
- Southwest Region (Grays Harbor, Lewis, Mason, Thurston, Pierce, Clark, Cowlitz, Skamania, Wahkiakum, Clallam, Jefferson, Pacific): (360) 407-6300

These numbers are also listed at the following web site: http://www.ecy.wa.gov/programs/wq/stormwater/construction/permit.html

ii. Review the SWPPP for compliance with Special Condition S9 and make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.

iii. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible, addressing the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.

iv. Document BMP implementation and maintenance in the site log book.

v. Continue to sample discharges daily until:

a) Turbidity is 25 NTU (or lower); or

b) Transparency is 33 cm (or greater); or

c) The Permittee has demonstrated compliance with the water quality limit for turbidity:

1) No more than 5 NTU over background turbidity, if background is less than 50 NTU, or

2) No more than 10% over background turbidity, if background is 50 NTU or greater; or

d) The discharge stops or is eliminated.

D. pH Sampling Requirements -- Significant Concrete Work or Engineered Soils

If construction activity results in the disturbance of 1 acre or more, **and** involves significant concrete work (significant concrete work means greater than 1000 cubic yards poured concrete or recycled concrete used over the life of a project) or the use of engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD], or fly ash), and stormwater from the affected area drains to surface waters of the State or to a storm sewer system that drains to surface waters of the state, the Permittee must conduct pH monitoring as set forth below. Note: In addition, discharges to segments of water bodies on Washington State's 303(d) list (Category 5) for high pH are subject to a numeric effluent limit for pH; refer to Special Condition S8.

1. For sites with significant concrete work, the Permittee must begin the pH monitoring period when the concrete is first poured and exposed to precipitation, and continue weekly throughout and after the concrete pour and curing period, until stormwater pH is in the range of 6.5 to 8.5 (su).

2. For sites with engineered soils, the Permittee must begin the pH monitoring period when the soil amendments are first exposed to precipitation and must continue until the area of engineered soils is fully stabilized.

3. During the applicable pH monitoring period defined above, the Permittee must obtain a representative sample of stormwater and conduct pH analysis at least once per week.

4. The Permittee must monitor pH in the sediment trap/pond(s) or other locations that receive stormwater runoff from the area of significant concrete work or engineered soils before the stormwater discharges to surface waters.

5. The benchmark value for pH is 8.5 standard units. Anytime sampling indicates that pH is 8.5 or greater, the Permittee must either:

   a. Prevent the high pH water (8.5 or above) from entering storm sewer systems or surface waters; or

   b. If necessary, adjust or neutralize the high pH water until it is in the range of pH 6.5 to 8.5 (su) using an appropriate treatment BMP such as carbon dioxide (CO_2) sparging or dry ice. The Permittee must obtain written approval from Ecology before using any form of chemical treatment other than CO_2 sparging or dry ice.

6. The Permittee must perform pH analysis on site with a calibrated pH meter, pH test kit, or wide range pH indicator paper. The Permittee must record pH monitoring results in the site log book.

S5. REPORTING AND RECORDKEEPING REQUIREMENTS

A. High Turbidity Phone Reporting

Anytime sampling performed in accordance with Special Condition S4.C indicates turbidity has reached the 250 NTU phone reporting level, the Permittee must call Ecology's Regional office by phone within 24 hours of analysis. The web site is http://www.ecy.wa.gov/programs/wq/stormwater/construction/permit.html. Also see phone numbers in Special Condition S4.C.5.b.i.

B. Discharge Monitoring Reports

Permittees required to conduct water quality sampling in accordance with Special Conditions S4.C (Turbidity/Transparency), S4.D (pH), S8 (303[d]/TMDL sampling), and/or G13 (Additional Sampling) must submit the results to Ecology.

Permittees must submit monitoring data using Ecology's WebDMR program. To find out more information and to sign up for WebDMR go to: http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html.

Permittees unable to submit electronically (for example, those who do not have an internet connection) must contact Ecology to request a waiver and obtain instructions on how to obtain a paper copy DMR at:

Mailing Address:
Department of Ecology
Water Quality Program
Attn: Stormwater Compliance Specialist
PO Box 47696
Olympia, WA 98504-7696

Permittees who obtain a waiver not to use WebDMR must use the forms provided to them by Ecology; submittals must be mailed to the address above. Permittees shall submit DMR forms to be received by Ecology within 15 days following the end of each month.

If there was no discharge during a given monitoring period, all Permittees must submit a DMR as required with ―no discharge" entered in place of the monitoring results. For more information, contact Ecology staff using information provided at the following web site: http://www.ecy.wa.gov/programs/spills/response/assistancesoil%20map.pdf

C. Records Retention

The Permittee must retain records of all monitoring information (site log book, sampling results, inspection reports/checklists, etc.), Stormwater Pollution Prevention Plan, and any other documentation of compliance with permit requirements for the entire life of the construction project and for a minimum of three years following the termination of permit coverage. Such information must include all calibration and maintenance records, and records of all data used to complete the application for this permit. This period of retention must be extended during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology.

D. Recording Results

For each measurement or sample taken, the Permittee must record the following information:

1. Date, place, method, and time of sampling or measurement.
2. The first and last name of the individual who performed the sampling or measurement.
3. The date(s) the analyses were performed.
4. The first and last name of the individual who performed the analyses.
5. The analytical techniques or methods used.
6. The results of all analyses.

E. Additional Monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by this permit using test procedures specified by Special Condition S4 of this permit, the results of this monitoring must be included in the calculation and reporting of the data submitted in the Permittee's DMR.

F. Noncompliance Notification

In the event the Permittee is unable to comply with any part of the terms and conditions of this permit, and the resulting noncompliance may cause a threat to human health or the environment, the Permittee must:

1. Immediately notify Ecology of the failure to comply by calling the applicable Regional office ERTS phone number (find at http://www.ecy.wa.gov/programs/spills/response/assistancesoil%20map.pdf) or refer to Special Condition S4.C.5.b.i.
2. Immediately take action to prevent the discharge/pollution, or otherwise stop or correct the noncompliance, and, if applicable, repeat sampling and analysis of any noncompliance immediately and submit the results to Ecology within five (5) days of becoming aware of the violation.
3. Submit a detailed written report to Ecology within five (5) days, unless requested earlier by Ecology. The report must contain a description of the noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

The Permittee must report any unanticipated bypass and/or upset that exceeds any effluent limit in the permit in accordance with the 24-hour reporting requirement contained in 40 C.F.R. 122.41(l)(6)).

Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for failure to comply. Refer to Section G14 of this permit for specific information regarding non-compliance.

G. Access to Plans and Records

1. The Permittee must retain the following permit documentation (plans and records) on site, or within reasonable access to the site, for use by the operator or for on-site review by Ecology or the local jurisdiction:

    a. General Permit.

    b. Permit Coverage Letter.

    c. Stormwater Pollution Prevention Plan (SWPPP).

    d. Site Log Book.

2. The Permittee must address written requests for plans and records listed above (Special Condition S5.G.1) as follows:

    a. The Permittee must provide a copy of plans and records to Ecology within 14 days of receipt of a written request from Ecology.

    b. The Permittee must provide a copy of plans and records to the public when requested in writing. Upon receiving a written request from the public for the Permittee's plans and records, the Permittee must either:

        i. Provide a copy of the plans and records to the requester within 14 days of a receipt of the written request; or

        ii. Notify the requester within 10 days of receipt of the written request of the location and times within normal business hours when the plans and records may be viewed; and provide access to the plans and records within 14 days of receipt of the written request; or

        Within 14 days of receipt of the written request, the Permittee may submit a copy of the plans and records to Ecology for viewing and/or copying by the requester at an Ecology office, or a mutually agreed location. If plans and records are viewed and/or copied at a location other than at an Ecology office, the Permittee will provide reasonable access to copying services for which a reasonable fee may be charged. The Permittee must notify the requester within 10 days of receipt of the request where the plans and records may be viewed and/or copied.

S6. PERMIT FEES

The Permittee must pay permit fees assessed by Ecology. Fees for stormwater discharges covered under this permit are established by Chapter 173-224 WAC. Ecology continues to assess permit fees until the permit is terminated in accordance with Special Condition S10 or revoked in accordance with General Condition G5.

S7. SOLID AND LIQUID WASTE DISPOSAL

The Permittee must handle and dispose of solid and liquid wastes generated by construction activity, such as demolition debris, construction materials, contaminated materials, and waste materials from maintenance activities, including liquids and solids from cleaning catch basins and other stormwater facilities, in accordance with:

A. Special Condition S3, Compliance with Standards.

B. WAC 173-216-110.

C. Other applicable regulations.

S8. DISCHARGES TO 303(D) OR TMDL WATER BODIES

A. <u>Sampling and Numeric Effluent Limits For Certain Discharges to 303(d)-listed Water Bodies</u>

1. Permittees who discharge to segments of water bodies listed as impaired by the State of Washington under Section 303(d) of the Clean Water Act for turbidity, fine sediment, high pH, or phosphorus, must conduct water quality sampling according to the requirements of this section, and Special Conditions S4.C.2.b-f and S4.C.3.b-d, and must comply with the applicable numeric effluent limitations in S8.C and S8.D.

2. All references and requirements associated with Section 303(d) of the Clean Water Act mean the most current listing by Ecology of impaired waters (Category 5) that exists on January 1, 2011, or the date when the operator's complete permit application is received by Ecology, whichever is later.

B. <u>Limits on Coverage for New Discharges to TMDL or 303(d)-listed Waters</u>

Operators of construction sites that discharge to a 303(d)-listed water body are not eligible for coverage under this permit *unless* the operator:

1. Prevents exposing stormwater to pollutants for which the water body is impaired, and retains documentation in the SWPPP that details procedures taken to prevent exposure on site; or

2. Documents that the pollutants for which the water body is impaired are not present at the site, and retains documentation of this finding within the SWPPP; or

3. Provides Ecology with data indicating the discharge is not expected to cause or contribute to an exceedance of a water quality standard, and retains such data on site with the SWPPP. The operator must provide data and other technical information to Ecology that sufficiently demonstrate:

   a. For discharges to waters without an EPA-approved or -established TMDL, that the discharge of the pollutant for which the water is impaired will meet in-stream water quality criteria at the point of discharge to the water body; or

   b. For discharges to waters with an EPA-approved or -established TMDL, that there is sufficient remaining wasteload allocation in the TMDL to allow construction stormwater discharge and that existing dischargers to the water body are subject to compliance schedules designed to bring the water body into attainment with water quality standards.

   Operators of construction sites are eligible for coverage under this permit if Ecology issues permit coverage based upon an affirmative determination that the discharge will not cause or contribute to the existing impairment.

C. Sampling and Numeric Effluent Limits for Discharges to Water Bodies on the 303(d) List for Turbidity, Fine Sediment, or Phosphorus

1. Permittees who discharge to segments of water bodies on the 303(d) list (Category 5) for turbidity, fine sediment, or phosphorus must conduct turbidity sampling in accordance with Special Condition S4.C.2 and comply with either of the numeric effluent limits noted in Table 5 below.

2. As an alternative to the 25 NTU effluent limit noted in Table 5 below (applied at the point where stormwater [or authorized non-stormwater] is discharged off-site), permittees may choose to comply with the surface water quality standard for turbidity. The standard is: no more than 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or no more than a 10% increase in turbidity when the background turbidity is more than 50 NTU. In order to use the water quality standard requirement, the sampling must take place at the following locations:

   a. Background turbidity in the 303(d)-listed receiving water immediately upstream (upgradient) or outside the area of influence of the discharge.

   b. Turbidity at the point of discharge into the 303(d)-listed receiving water, inside the area of influence of the discharge.

3. Discharges that exceed the numeric effluent limit for turbidity constitute a violation of this permit.

4. Permittees whose discharges exceed the numeric effluent limit shall sample discharges daily until the violation is corrected and comply with the non-compliance notification requirements in Special Condition S5.F.

Table 5. Turbidity, Fine Sediment & Phosphorus Sampling and Limits for 303(d)-Listed Waters

Parameter identified in 303(d) listing	Parameter Sampled	Unit	Analytical Method	Sampling Frequency	Numeric Effluent Limit[1]
• Turbidity • Fine Sediment • Phosphorus	Turbidity	NTU	SM2130 or EPA180.1	Weekly, if discharging	25 NTU, at the point where stormwater is discharged from the site; OR In compliance with the surface water quality standard for turbidity (S8.C.1.a)

[1]Permittees subject to a numeric effluent limit for turbidity may, at their discretion, choose either numeric effluent limitation based on site-specific considerations including, but not limited to, safety, access and convenience.

D. Discharges to Water Bodies on the 303(d) List for High pH

1. Permittees who discharge to segments of water bodies on the 303(d) list (Category 5) for high pH must conduct pH sampling in accordance with the table below, and comply with the numeric effluent limit of pH 6.5 to 8.5 su (Table 6).

Table 6. pH Sampling and Limits for 303(d)-Listed Waters

Parameter identified in 303(d) listing	Parameter Sampled/Units	Analytical Method	Sampling Frequency	Numeric Effluent Limit
High pH	pH /Standard Units	pH meter	Weekly, if discharging	In the range of 6.5 – 8.5

2. At the Permittee's discretion, compliance with the limit shall be assessed at one of the following locations:

   a. Directly in the 303(d)-listed water body segment, inside the immediate area of influence of the discharge; or

   b. Alternatively, the permittee may measure pH at the point where the discharge leaves the construction site, rather than in the receiving water.

3. Discharges that exceed the numeric effluent limit for pH (outside the range of 6.5 – 8.5 su) constitute a violation of this permit.

4. Permittees whose discharges exceed the numeric effluent limit shall sample discharges daily until the violation is corrected and comply with the non-compliance notification requirements in Special Condition S5.F.

E. Sampling and Limits for Sites Discharging to Waters Covered by a TMDL or Another Pollution Control Plan

1. Discharges to a water body that is subject to a Total Maximum Daily Load (TMDL) for turbidity, fine sediment, high pH, or phosphorus must be consistent with the TMDL. Refer to http://www.ecy.wa.gov/programs/wq/tmdl/index.html for more information on TMDLs.

   a. Where an applicable TMDL sets specific waste load allocations or requirements for discharges covered by this permit, discharges must be consistent with any specific waste load allocations or requirements established by the applicable TMDL.

      i. The Permittee must sample discharges weekly or as otherwise specified by the TMDL to evaluate compliance with the specific waste load allocations or requirements.

      ii. Analytical methods used to meet the monitoring requirements must conform to the latest revision of the Guidelines Establishing Test Procedures for the Analysis of Pollutants contained in 40 CFR Part 136. Turbidity and pH methods need not be accredited or registered unless conducted at a laboratory which must otherwise be accredited or registered.

   b. Where an applicable TMDL has established a general waste load allocation for construction stormwater discharges, but has not identified specific requirements, compliance with Special Conditions S4 (Monitoring) and S9 (SWPPPs) will constitute compliance with the approved TMDL.

   c. Where an applicable TMDL has not specified a waste load allocation for construction stormwater discharges, but has not excluded these discharges, compliance with Special Conditions S4 (Monitoring) and S9 (SWPPPs) will constitute compliance with the approved TMDL.

   d. Where an applicable TMDL specifically precludes or prohibits discharges from construction activity, the operator is not eligible for coverage under this permit.

2. Applicable TMDL means a TMDL for turbidity, fine sediment, high pH, or phosphorus that is completed and approved by EPA before January 1, 2011, or before the date the operator's complete permit application is received by Ecology, whichever is later. TMDLs completed after the operator's complete permit application is received by Ecology become applicable to the Permittee only if they are imposed through an administrative order by Ecology, or through a modification of permit coverage.

S9. STORMWATER POLLUTION PREVENTION PLAN

The Permittee must prepare and properly implement an adequate Stormwater Pollution Prevention Plan (SWPPP) for construction activity in accordance with the requirements of this permit beginning with initial soil disturbance and until final stabilization.

A. The Permittee's SWPPP must meet the following objectives:

1. To implement best management practices (BMPs) to prevent erosion and sedimentation, and to identify, reduce, eliminate or prevent stormwater contamination and water pollution from construction activity.

2. To prevent violations of surface water quality, ground water quality, or sediment management standards.

3. To control peak volumetric flow rates and velocities of stormwater discharges.

B. General Requirements

1. The SWPPP must include a narrative and drawings. All BMPs must be clearly referenced in the narrative and marked on the drawings. The SWPPP narrative must include documentation to explain and justify the pollution prevention decisions made for the project. Documentation must include:

   a. Information about existing site conditions (topography, drainage, soils, vegetation, etc.).

   b. Potential erosion problem areas.

   c. The 12 elements of a SWPPP in Special Condition S9.D.1-12, including BMPs used to address each element.

   d. Construction phasing/sequence and general BMP implementation schedule.

   e. The actions to be taken if BMP performance goals are not achieved—for example, a contingency plan for additional treatment and/or storage of stormwater that would violate the water quality standards if discharged.

   f. Engineering calculations for ponds and any other designed structures.

2. The Permittee must modify the SWPPP if, during inspections or investigations conducted by the owner/operator, or the applicable local or state regulatory authority, it is determined that the SWPPP is, or would be, ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site. The Permittee must then:

   a. Review the SWPPP for compliance with Special Condition S9 and make appropriate revisions within 7 days of the inspection or investigation.

   b. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible, addressing the problems no later than 10 days from the inspection or investigation. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when an extension is requested by a Permittee within the initial 10-day response period,

c. Document BMP implementation and maintenance in the site log book.

The Permittee must modify the SWPPP whenever there is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

C. Stormwater Best Management Practices (BMPs)

BMPs must be consistent with:

1. Stormwater Management Manual for Western Washington (most recent edition), for sites west of the crest of the Cascade Mountains; or

2. Stormwater Management Manual for Eastern Washington (most recent edition), for sites east of the crest of the Cascade Mountains; or

3. Revisions to the manuals listed in Special Condition S9.C.1. & 2., or other stormwater management guidance documents or manuals which provide an equivalent level of pollution prevention, that are approved by Ecology and incorporated into this permit in accordance with the permit modification requirements of WAC 173-226-230; or

4. Documentation in the SWPPP that the BMPs selected provide an equivalent level of pollution prevention, compared to the applicable Stormwater Management Manuals, including:

   a. The technical basis for the selection of all stormwater BMPs (scientific, technical studies, and/or modeling) that support the performance claims for the BMPs being selected.

   b. An assessment of how the selected BMP will satisfy AKART requirements and the applicable federal technology-based treatment requirements under 40 CFR part 125.3.

D. SWPPP – Narrative Contents and Requirements

The Permittee must include each of the 12 elements below in Special Condition S9.D.1-12 in the narrative of the SWPPP and implement them unless site conditions render the element unnecessary and the exemption from that element is clearly justified in the SWPPP.

1. Preserve Vegetation/Mark Clearing Limits

   a. Before beginning land-disturbing activities, including clearing and grading, clearly mark all clearing limits, sensitive areas and their buffers, and trees that are to be preserved within the construction area.

b. Retain the duff layer, native top soil, and natural vegetation in an undisturbed state to the maximum degree practicable.

2. Establish Construction Access

a. Limit construction vehicle access and exit to one route, if possible.

b. Stabilize access points with a pad of quarry spalls, crushed rock, or other equivalent BMPs, to minimize tracking sediment onto roads.

c. Locate wheel wash or tire baths on site, if the stabilized construction entrance is not effective in preventing tracking sediment onto roads.

d. If sediment is tracked off site, clean the affected roadway thoroughly at the end of each day, or more frequently as necessary (for example, during wet weather). Remove sediment from roads by shoveling, sweeping, or pickup and transport of the sediment to a controlled sediment disposal area.

e. Conduct street washing only after sediment removal in accordance with Special Condition S9.D.2.d. Control street wash wastewater by pumping back on site or otherwise preventing it from discharging into systems tributary to waters of the State.

3. Control Flow Rates

a. Protect properties and waterways downstream of development sites from erosion and the associated discharge of turbid waters due to increases in the velocity and peak volumetric flow rate of stormwater runoff from the project site, as required by local plan approval authority.

b. Where necessary to comply with Special Condition S9.D.3.a, construct stormwater retention or detention facilities as one of the first steps in grading. Assure that detention facilities function properly before constructing site improvements (for example, impervious surfaces).

c. If permanent infiltration ponds are used for flow control during construction, protect these facilities from siltation during the construction phase.

4. Install Sediment Controls

The Permittee must design, install and maintain effective erosion controls and sediment controls to minimize the discharge of pollutants. At a minimum, the Permittee must design, install and maintain such controls to:

a. Construct sediment control BMPs (sediment ponds, traps, filters, etc.) as one of the first steps in grading. These BMPs must be functional before other land disturbing activities take place.

b. Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls must address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site.

c. Direct stormwater runoff from disturbed areas through a sediment pond or other appropriate sediment removal BMP, before the runoff leaves a construction site or before discharge to an infiltration facility. Runoff from fully stabilized areas may be discharged without a sediment removal BMP, but must meet the flow control performance standard of Special Condition S9.D.3.a.

d. Locate BMPs intended to trap sediment on site in a manner to avoid interference with the movement of juvenile salmonids attempting to enter off-channel areas or drainages.

e. Provide and maintain natural buffers around surface waters, direct stormwater to vegetated areas to increase sediment removal and maximize stormwater infiltration, unless infeasible.

f. Where feasible, design outlet structures that withdraw impounded stormwater from the surface to avoid discharging sediment that is still suspended lower in the water column.

5. Stabilize Soils

a. The Permittee must stabilize exposed and unworked soils by application of effective BMPs that prevent erosion. Applicable BMPs include, but are not limited to: temporary and permanent seeding, sodding, mulching, plastic covering, erosion control fabrics and matting, soil application of polyacrylamide (PAM), the early application of gravel base on areas to be paved, and dust control.

b. The Permittee must control stormwater volume and velocity within the site to minimize soil erosion.

c. The Permittee must control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion.

d. Depending on the geographic location of the project, the Permittee must not allow soils to remain exposed and unworked for more than the time periods set forth below to prevent erosion:

West of the Cascade Mountains Crest
During the dry season (May 1 - Sept. 30): 7 days
During the wet season (October 1 - April 30): 2 days

East of the Cascade Mountains Crest, except for Central Basin*
During the dry season (July 1 - September 30): 10 days
During the wet season (October 1 - June 30): 5 days

The Central Basin*, East of the Cascade Mountains Crest

During the dry Season (July 1 - September 30): 30 days
During the wet season (October 1 - June 30): 15 days

*Note: The Central Basin is defined as the portions of Eastern Washington with mean annual precipitation of less than 12 inches.

e. The Permittee must stabilize soils at the end of the shift before a holiday or weekend if needed based on the weather forecast.

f. The Permittee must stabilize soil stockpiles from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.

g. The Permittee must minimize the amount of soil exposed during construction activity.

h. The Permittee must minimize the disturbance of steep slopes.

i. The Permittee must minimize soil compaction and, unless infeasible, preserve topsoil.

6. Protect Slopes

a. The Permittee must design and construct cut-and-fill slopes in a manner to minimize erosion. Applicable practices include, but are not limited to, reducing continuous length of slope with terracing and diversions, reducing slope steepness, and roughening slope surfaces (for example, track walking).

b. The Permittee must divert off-site stormwater (run-on) or ground water away from slopes and disturbed areas with interceptor dikes, pipes, and/or swales. Off-site stormwater should be managed separately from stormwater generated on the site.

c. At the top of slopes, collect drainage in pipe slope drains or protected channels to prevent erosion.

i. West of the Cascade Mountains Crest: Temporary pipe slope drains must handle the peak 10-minute velocity of flow from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year, 1-hour flow rate predicted by an approved continuous runoff model, increased by a factor of 1.6, may be used. The hydrologic analysis must use the existing land cover condition for predicting flow rates from tributary areas outside the project limits. For tributary areas on the project site, the analysis must use the temporary or permanent project land cover condition, whichever will produce the highest flow rates. If using the Western Washington Hydrology Model (WWHM) to predict flows, bare soil areas should be modeled as "landscaped area."

ii. East of the Cascade Mountains Crest: Temporary pipe slope drains must handle the expected peak flow velocity from a 6-month, 3-hour storm for the developed condition, referred to as the short duration storm.

d. Place excavated material on the uphill side of trenches, consistent with safety and space considerations.

e. Place check dams at regular intervals within constructed channels that are cut down a slope.

7. Protect Drain Inlets

a. Protect all storm drain inlets made operable during construction so that stormwater runoff does not enter the conveyance system without first being filtered or treated to remove sediment.

b. Clean or remove and replace inlet protection devices when sediment has filled one-third of the available storage (unless a different standard is specified by the product manufacturer).

8. Stabilize Channels and Outlets

a. Design, construct and stabilize all on-site conveyance channels to prevent erosion from the following expected peak flows:

i. West of the Cascade Mountains Crest: Channels must handle the peak 10-minute velocity of flow from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year, 1-hour flow rate indicated by an approved continuous runoff model, increased by a factor of 1.6, may be used. The hydrologic analysis must use the existing land cover condition for predicting flow rates from tributary areas outside the project limits. For tributary areas on the project site, the analysis must use the temporary or permanent project land cover condition, whichever will produce the highest flow rates. If using the WWHM to predict flows, bare soil areas should be modeled as "landscaped area."

ii. East of the Cascade Mountains Crest: Channels must handle the expected peak flow velocity from a 6-month, 3-hour storm for the developed condition, referred to as the short duration storm.

b. Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches at the outlets of all conveyance systems.

9. Control Pollutants

Design, install, implement and maintain effective pollution prevention measures to minimize the discharge of pollutants. The Permittee must:

a. Handle and dispose of all pollutants, including waste materials and demolition debris that occur on site in a manner that does not cause contamination of stormwater.

b. Provide cover, containment, and protection from vandalism for all chemicals, liquid products, petroleum products, and other materials that have the potential to pose a threat to human health or the environment. On-site fueling tanks must include secondary containment. Secondary containment means placing tanks or containers within an impervious structure capable of containing 110% of the volume contained in the largest tank within the containment structure. Double-walled tanks do not require additional secondary containment.

c. Conduct maintenance, fueling, and repair of heavy equipment and vehicles using spill prevention and control measures. Clean contaminated surfaces immediately following any spill incident.

d. Discharge wheel wash or tire bath wastewater to a separate on-site treatment system that prevents discharge to surface water, such as closed-loop recirculation or upland land application, or to the sanitary sewer with local sewer district approval.

e. Apply fertilizers and pesticides in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Follow manufacturers' label requirements for application rates and procedures.

f. Use BMPs to prevent contamination of stormwater runoff by pH-modifying sources. The sources for this contamination include, but are not limited to: bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, dewatering concrete vaults, concrete pumping and mixer washout waters. (Also refer to the definition for "concrete wastewater" in Appendix A--Definitions.)

g. Adjust the pH of stormwater if necessary to prevent violations of water quality standards.

h. Assure that washout of concrete trucks is performed offsite or in designated concrete washout areas only. Do not wash out concrete trucks onto the ground, or into storm drains, open ditches, streets, or streams. Do not dump excess concrete on site, except in designated concrete washout areas. Concrete spillage or concrete discharge to surface waters of the State is prohibited.

i. Obtain written approval from Ecology before using chemical treatment other than CO_2 or dry ice to adjust pH.

10. Control Dewatering

a. Permittees must discharge foundation, vault, and trench dewatering water, which have characteristics similar to stormwater runoff at the site, into a controlled conveyance system before discharge to a sediment trap or sediment pond.

b. Permittees may discharge clean, non-turbid dewatering water, such as well-point ground water, to systems tributary to, or directly into surface waters of the State, as specified in Special Condition S9.D.8, provided the dewatering flow does not cause erosion or flooding of receiving waters. Do not route clean dewatering water through stormwater sediment ponds. Note that –surface waters of the State" may exist on a construction site as well as off site; for example, a creek running through a site.

c. Other treatment or disposal options may include:

   i. Infiltration.

   ii. Transport off site in a vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute state waters.

   iii. Ecology-approved on-site chemical treatment or other suitable treatment technologies.

   iv. Sanitary or combined sewer discharge with local sewer district approval, if there is no other option.

   v. Use of a sedimentation bag with discharge to a ditch or swale for small volumes of localized dewatering.

d. Permittees must handle highly turbid or contaminated dewatering water separately from stormwater.

11. Maintain BMPs

   a. Permittees must maintain and repair all temporary and permanent erosion and sediment control BMPs as needed to assure continued performance of their intended function in accordance with BMP specifications.

   b. Permittees must remove all temporary erosion and sediment control BMPs within 30 days after achieving final site stabilization or after the temporary BMPs are no longer needed.

12. Manage the Project

   a. Phase development projects to the maximum degree practicable and take into account seasonal work limitations.

   b. Inspection and monitoring -- Inspect, maintain and repair all BMPs as needed to assure continued performance of their intended function. Conduct site inspections and monitoring in accordance with Special Condition S4.

   c. Maintaining an updated construction SWPPP -- Maintain, update, and implement the SWPPP in accordance with Special Conditions S3, S4 and S9.

E. SWPPP – Map Contents and Requirements

The Permittee's SWPPP must also include a vicinity map or general location map (for example, a USGS quadrangle map, a portion of a county or city map, or other appropriate map) with enough detail to identify the location of the construction site and receiving waters within one mile of the site.

The SWPPP must also include a legible site map (or maps) showing the entire construction site. The following features must be identified, unless not applicable due to site conditions:

1. The direction of north, property lines, and existing structures and roads.
2. Cut and fill slopes indicating the top and bottom of slope catch lines.
3. Approximate slopes, contours, and direction of stormwater flow before and after major grading activities.
4. Areas of soil disturbance and areas that will not be disturbed.
5. Locations of structural and nonstructural controls (BMPs) identified in the SWPPP.
6. Locations of off-site material, stockpiles, waste storage, borrow areas, and vehicle/equipment storage areas.
7. Locations of all surface water bodies, including wetlands.
8. Locations where stormwater or non-stormwater discharges off-site and/or to a surface water body, including wetlands.
9. Location of water quality sampling station(s), if sampling is required by state or local permitting authority.
10. Areas where final stabilization has been accomplished and no further construction-phase permit requirements apply.

S10. NOTICE OF TERMINATION

A. The site is eligible for termination of coverage when it has met any of the following conditions:

1. The site has undergone final stabilization, the Permittee has removed all temporary BMPs (except biodegradable BMPs clearly manufactured with the intention for the material to be left in place and not interfere with maintenance or land use), and all stormwater discharges associated with construction activity have been eliminated; or
2. All portions of the site that have not undergone final stabilization per Special Condition S10.A.1 have been sold and/or transferred (per General Condition G9), and the Permittee no longer has operational control of the construction activity; or

3. For residential construction only, the Permittee has completed temporary stabilization and the homeowners have taken possession of the residences.

B. When the site is eligible for termination, the Permittee must submit a complete and accurate Notice of Termination (NOT) form, signed in accordance with General Condition G2, to:

Department of Ecology
Water Quality Program - Construction Stormwater
PO Box 47696
Olympia, Washington 98504-7696

The termination is effective on the date Ecology receives the NOT form, unless Ecology notifies the Permittee within 30 days that termination request is denied because the Permittee has not met the eligibility requirements in Special Condition S10.A.

Permittees transferring the property to a new property owner or operator/permittee are required to complete and submit the Notice of Transfer form to Ecology, but are not required to submit a Notice of Termination form for this type of transaction.

GENERAL CONDITIONS

G1. DISCHARGE VIOLATIONS

All discharges and activities authorized by this general permit must be consistent with the terms and conditions of this general permit. Any discharge of any pollutant more frequent than or at a level in excess of that identified and authorized by the general permit must constitute a violation of the terms and conditions of this permit.

G2. SIGNATORY REQUIREMENTS

A. All permit applications must bear a certification of correctness to be signed:

1. In the case of corporations, by a responsible corporate officer of at least the level of vice president of a corporation;
2. In the case of a partnership, by a general partner of a partnership;
3. In the case of sole proprietorship, by the proprietor; or
4. In the case of a municipal, state, or other public facility, by either a principal executive officer or ranking elected official.

B. All reports required by this permit and other information requested by Ecology must be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

1. The authorization is made in writing by a person described above and submitted to the Ecology.
2. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters.

C. Changes to authorization. If an authorization under paragraph G2.B.2 above is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph G2.B.2 above must be submitted to Ecology prior to or together with any reports, information, or applications to be signed by an authorized representative.

D. Certification. Any person signing a document under this section must make the following certification:

I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

G3. RIGHT OF INSPECTION AND ENTRY

The Permittee must allow an authorized representative of Ecology, upon the presentation of credentials and such other documents as may be required by law:

A. To enter upon the premises where a discharge is located or where any records are kept under the terms and conditions of this permit.

B. To have access to and copy – at reasonable times and at reasonable cost -- any records required to be kept under the terms and conditions of this permit.

C. To inspect -- at reasonable times – any facilities, equipment (including monitoring and control equipment), practices, methods, or operations regulated or required under this permit.

D. To sample or monitor – at reasonable times – any substances or parameters at any location for purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act.

G4. GENERAL PERMIT MODIFICATION AND REVOCATION

This permit may be modified, revoked and reissued, or terminated in accordance with the provisions of Chapter 173-226 WAC. Grounds for modification, revocation and reissuance, or termination include, but are not limited to, the following:

A. When a change occurs in the technology or practices for control or abatement of pollutants applicable to the category of dischargers covered under this permit.

B. When effluent limitation guidelines or standards are promulgated pursuant to the CWA or Chapter 90.48 RCW, for the category of dischargers covered under this permit.

C. When a water quality management plan containing requirements applicable to the category of dischargers covered under this permit is approved, or

D. When information is obtained that indicates cumulative effects on the environment from dischargers covered under this permit are unacceptable.

G5. REVOCATION OF COVERAGE UNDER THE PERMIT

Pursuant to Chapter 43.21B RCW and Chapter 173-226 WAC, the Director may terminate coverage for any discharger under this permit for cause. Cases where coverage may be terminated include, but are not limited to, the following:

A. Violation of any term or condition of this permit.

B. Obtaining coverage under this permit by misrepresentation or failure to disclose fully all relevant facts.

C. A change in any condition that requires either a temporary or permanent reduction or elimination of the permitted discharge.

D. Failure or refusal of the Permittee to allow entry as required in RCW 90.48.090.

E. A determination that the permitted activity endangers human health or the environment, or contributes to water quality standards violations.

F. Nonpayment of permit fees or penalties assessed pursuant to RCW 90.48.465 and Chapter 173-224 WAC.

G. Failure of the Permittee to satisfy the public notice requirements of WAC 173-226-130(5), when applicable.

The Director may require any discharger under this permit to apply for and obtain coverage under an individual permit or another more specific general permit. Permittees who have their coverage revoked for cause according to WAC 173-226-240 may request temporary coverage under this permit during the time an individual permit is being developed, provided the request is made within ninety (90) days from the time of revocation and is submitted along with a complete individual permit application form.

G6. REPORTING A CAUSE FOR MODIFICATION

The Permittee must submit a new application, or a supplement to the previous application, whenever a material change to the construction activity or in the quantity or type of discharge is anticipated which is not specifically authorized by this permit. This application must be submitted at least sixty (60) days prior to any proposed changes. Filing a request for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not relieve the Permittee of the duty to comply with the existing permit until it is modified or reissued.

G7. COMPLIANCE WITH OTHER LAWS AND STATUTES

Nothing in this permit will be construed as excusing the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G8. DUTY TO REAPPLY

The Permittee must apply for permit renewal at least 180 days prior to the specified expiration date of this permit.

G9. TRANSFER OF GENERAL PERMIT COVERAGE

Coverage under this general permit is automatically transferred to a new discharger, including operators of lots/parcels within a common plan of development or sale, **if**:

A. A written agreement (Transfer of Coverage Form) between the current discharger (Permittee) and new discharger, signed by both parties and containing a specific date for transfer of permit responsibility, coverage, and liability is submitted to the Director; and

B. The Director does not notify the current discharger and new discharger of the Director's intent to revoke coverage under the general permit. If this notice is not given, the transfer is effective on the date specified in the written agreement.

When a current discharger (Permittee) transfers a portion of a permitted site, the current discharger must also submit an updated application form (NOI) to the Director indicating the remaining permitted acreage after the transfer.

G10. REMOVED SUBSTANCES

The Permittee must not re-suspend or reintroduce collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of stormwater to the final effluent stream for discharge to state waters.

G11. DUTY TO PROVIDE INFORMATION

The Permittee must submit to Ecology, within a reasonable time, all information that Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee must also submit to Ecology, upon request, copies of records required to be kept by this permit [40 CFR 122.41(h)].

G12. OTHER REQUIREMENTS OF 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

G13. ADDITIONAL MONITORING

Ecology may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G14. PENALTIES FOR VIOLATING PERMIT CONDITIONS

Any person who is found guilty of willfully violating the terms and conditions of this permit shall be deemed guilty of a crime, and upon conviction thereof shall be punished by a fine of up to ten thousand dollars ($10,000) and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs may be deemed a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit shall incur, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars ($10,000) for every such violation. Each and every such violation shall be a separate and distinct offense, and in case of a continuing violation, every day's continuance shall be deemed to be a separate and distinct violation.

G15. UPSET

Definition – “Upset” means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of the following paragraph are met.

A Permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence that: 1) an upset occurred and that the Permittee can identify the cause(s) of the upset; 2) the permitted facility was being properly operated at the time of the upset; 3) the Permittee submitted notice of the upset as required in Special Condition S5.F, and; 4) the Permittee complied with any remedial measures required under this permit.

In any enforcement proceeding, the Permittee seeking to establish the occurrence of an upset has the burden of proof.

G16. PROPERTY RIGHTS

This permit does not convey any property rights of any sort, or any exclusive privilege.

G17. DUTY TO COMPLY

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

G18. TOXIC POLLUTANTS

The Permittee must comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if this permit has not yet been modified to incorporate the requirement.

G19. PENALTIES FOR TAMPERING

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two years per violation, or by both. If a conviction of a person is for a violation committed after a first conviction of such person under this condition, punishment shall be a fine of not more than $20,000 per day of violation, or imprisonment of not more than four (4) years, or both.

G20. REPORTING PLANNED CHANGES

The Permittee must, as soon as possible, give notice to Ecology of planned physical alterations, modifications or additions to the permitted construction activity. The Permittee should be aware that, depending on the nature and size of the changes to the original permit, a new public notice and other permit process requirements may be required. Changes in activities that require reporting to Ecology include those that will result in:

A. The permitted facility being determined to be a new source pursuant to 40 CFR 122.29(b).

B. A significant change in the nature or an increase in quantity of pollutants discharged, including but not limited to: for sites 5 acres or larger, a 20% or greater increase in acreage disturbed by construction activity.

C. A change in or addition of surface water(s) receiving stormwater or non-stormwater from the construction activity.

D. A change in the construction plans and/or activity that affects the Permittee's monitoring requirements in Special Condition S4.

Following such notice, permit coverage may be modified, or revoked and reissued pursuant to 40 CFR 122.62(a) to specify and limit any pollutants not previously limited. Until such modification is effective, any new or increased discharge in excess of permit limits or not specifically authorized by this permit constitutes a violation.

G21. REPORTING OTHER INFORMATION

Where the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to Ecology, it must promptly submit such facts or information.

G22. REPORTING ANTICIPATED NON-COMPLIANCE

The Permittee must give advance notice to Ecology by submission of a new application or supplement thereto at least forty-five (45) days prior to commencement of such discharges, of any facility expansions, production increases, or other planned changes, such as process modifications, in the permitted facility or activity which may result in noncompliance with permit limits or conditions. Any maintenance of facilities, which might necessitate unavoidable interruption of operation and degradation of effluent quality, must be scheduled during non-critical water quality periods and carried out in a manner approved by Ecology.

G23. REQUESTS TO BE EXCLUDED FROM COVERAGE UNDER THE PERMIT

Any discharger authorized by this permit may request to be excluded from coverage under the general permit by applying for an individual permit. The discharger must submit to the Director an application as described in WAC 173-220-040 or WAC 173-216-070, whichever is applicable, with reasons supporting the request. These reasons will fully document how an individual permit will apply to the applicant in a way that the general permit cannot. Ecology may make specific requests for information to support the request. The Director will either issue an individual permit or deny the request with a statement explaining the reason for the denial. When an individual permit is issued to a discharger otherwise subject to the construction stormwater general permit, the applicability of the construction stormwater general permit to that Permittee is automatically terminated on the effective date of the individual permit.

G24. APPEALS

A. The terms and conditions of this general permit, as they apply to the appropriate class of dischargers, are subject to appeal by any person within 30 days of issuance of this general permit, in accordance with Chapter 43.21B RCW, and Chapter 173-226 WAC.

B. The terms and conditions of this general permit, as they apply to an individual discharger, are appealable in accordance with Chapter 43.21B RCW within 30 days of the effective date of coverage of that discharger. Consideration of an appeal of general permit coverage of an individual discharger is limited to the general permit's applicability or nonapplicability to that individual discharger.

C. The appeal of general permit coverage of an individual discharger does not affect any other dischargers covered under this general permit. If the terms and conditions of this general permit are found to be inapplicable to any individual discharger(s), the matter shall be remanded to Ecology for consideration of issuance of an individual permit or permits.

G25. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit, or application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

G26. BYPASS PROHIBITED

A. Bypass Procedures

Bypass, which is the intentional diversion of waste streams from any portion of a treatment facility, is prohibited for stormwater events below the design criteria for stormwater management. Ecology may take enforcement action against a Permittee for bypass unless one of the following circumstances (1, 2, 3 or 4) is applicable.

1. Bypass of stormwater is consistent with the design criteria and part of an approved management practice in the applicable stormwater management manual.

2. Bypass for essential maintenance without the potential to cause violation of permit limits or conditions.

   Bypass is authorized if it is for essential maintenance and does not have the potential to cause violations of limitations or other conditions of this permit, or adversely impact public health.

3. Bypass of stormwater is unavoidable, unanticipated, and results in noncompliance of this permit.

   This bypass is permitted only if:

   a. Bypass is unavoidable to prevent loss of life, personal injury, or severe property damage. ―Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.

   b. There are no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment downtime (but not if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance), or transport of untreated wastes to another treatment facility.

c. Ecology is properly notified of the bypass as required in Special Condition S5.F of this permit.

4. A planned action that would cause bypass of stormwater and has the potential to result in noncompliance of this permit during a storm event.

   The Permittee must notify Ecology at least thirty (30) days before the planned date of bypass. The notice must contain:

   a. a description of the bypass and its cause

   b. an analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing.

   c. a cost-effectiveness analysis of alternatives including comparative resource damage assessment.

   d. the minimum and maximum duration of bypass under each alternative.

   e. a recommendation as to the preferred alternative for conducting the bypass.

   f. the projected date of bypass initiation.

   g. a statement of compliance with SEPA.

   h. a request for modification of water quality standards as provided for in WAC 173-201A-110, if an exceedance of any water quality standard is anticipated.

   i. steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass.

5. For probable construction bypasses, the need to bypass is to be identified as early in the planning process as possible. The analysis required above must be considered during preparation of the Stormwater Pollution Prevention Plan (SWPPP) and must be included to the extent practical. In cases where the probable need to bypass is determined early, continued analysis is necessary up to and including the construction period in an effort to minimize or eliminate the bypass.

   Ecology will consider the following before issuing an administrative order for this type bypass:

   a. If the bypass is necessary to perform construction or maintenance-related activities essential to meet the requirements of this permit.

   b. If there are feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, stopping production, maintenance during normal periods of equipment down time, or transport of untreated wastes to another treatment facility.

   c. If the bypass is planned and scheduled to minimize adverse effects on the public and the environment.

After consideration of the above and the adverse effects of the proposed bypass and any other relevant factors, Ecology will approve, conditionally approve, or deny the request. The public must be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible. Approval of a request to bypass will be by administrative order issued by Ecology under RCW 90.48.120.

B. Duty to Mitigate

The Permittee is required to take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

APPENDIX A – DEFINITIONS

AKART is an acronym for "all known, available, and reasonable methods of prevention, control, and treatment." AKART represents the most current methodology that can be reasonably required for preventing, controlling, or abating the pollutants and controlling pollution associated with a discharge.

Applicable TMDL means a TMDL for turbidity, fine sediment, high pH, or phosphorus, which was completed and approved by EPA before January 1, 2011, or before the date the operator's complete permit application is received by Ecology, whichever is later.

Applicant means an operator seeking coverage under this permit.

Best Management Practices (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the State. BMPs include treatment systems, operating procedures, and practices to control: stormwater associated with construction activity, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Buffer means an area designated by a local jurisdiction that is contiguous to and intended to protect a sensitive area.

Bypass means the intentional diversion of waste streams from any portion of a treatment facility.

Calendar Day A period of 24 consecutive hours starting at 12:00 midnight and ending the following 12:00 midnight.

Calendar Week (same as Week) means a period of seven consecutive days starting at 12:01 a.m. (0:01 hours) on Sunday.

Certified Erosion and Sediment Control Lead (CESCL) means a person who has current certification through an approved erosion and sediment control training program that meets the minimum training standards established by Ecology (see BMP C160 in the SWMM).

Clean Water Act (CWA) means the Federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, and 97-117; USC 1251 et seq.

Combined Sewer means a sewer which has been designed to serve as a sanitary sewer and a storm sewer, and into which inflow is allowed by local ordinance.

Common Plan of Development or Sale means a site where multiple separate and distinct construction activities may be taking place at different times on different schedules and/or by different contractors, but still under a single plan. Examples include: 1) phased projects and projects with multiple filings or lots, even if the separate phases or filings/lots will be constructed under separate contract or by separate owners (e.g., a development where lots are sold to separate builders); 2) a development plan that may be phased over multiple years, but is still under a consistent plan for long-term development; 3) projects in a contiguous area that may be unrelated but still under the same contract, such as construction of a building extension and a new parking lot at the same facility; and 4) linear projects such as roads, pipelines, or utilities. If the project is part of a common plan of development or sale, the disturbed area of the entire plan must be used in determining permit requirements.

Composite Sample means a mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increases while maintaining a constant time interval between the aliquots.

Concrete wastewater means any water used in the production, pouring and/or clean-up of concrete or concrete products, and any water used to cut, grind, wash, or otherwise modify concrete or concrete products. Examples include water used for or resulting from concrete truck/mixer/pumper/tool/chute rinsing or washing, concrete saw cutting and surfacing (sawing, coring, grinding, roughening, hydro-demolition, bridge and road surfacing). When stormwater comingles with concrete wastewater, the resulting water is considered concrete wastewater and must be managed to prevent discharge to waters of the state, including ground water.

Construction Activity means land disturbing operations including clearing, grading or excavation which disturbs the surface of the land. Such activities may include road construction, construction of residential houses, office buildings, or industrial buildings, and demolition activity.

Contaminant means any hazardous substance that does not occur naturally or occurs at greater than natural background levels. See definition of –hazardous substance” and WAC 173-340-200.

Demonstrably Equivalent means that the technical basis for the selection of all stormwater BMPs is documented within a SWPPP, including:

1. The method and reasons for choosing the stormwater BMPs selected.
2. The pollutant removal performance expected from the BMPs selected.
3. The technical basis supporting the performance claims for the BMPs selected, including any available data concerning field performance of the BMPs selected.
4. An assessment of how the selected BMPs will comply with state water quality standards.
5. An assessment of how the selected BMPs will satisfy both applicable federal technology-based treatment requirements and state requirements to use all known, available, and reasonable methods of prevention, control, and treatment (AKART).

Department means the Washington State Department of Ecology.

Detention means the temporary storage of stormwater to improve quality and/or to reduce the mass flow rate of discharge.

Dewatering means the act of pumping ground water or stormwater away from an active construction site.

Director means the Director of the Washington Department of Ecology or his/her authorized representative.

Discharger means an owner or operator of any facility or activity subject to regulation under Chapter 90.48 RCW or the Federal Clean Water Act.

Domestic Wastewater means water carrying human wastes, including kitchen, bath, and laundry wastes from residences, buildings, industrial establishments, or other places, together with such ground water infiltration or surface waters as may be present.

Ecology means the Washington State Department of Ecology.

Engineered Soils means the use of soil amendments including, but not limited, to Portland cement treated base (CTB), cement kiln dust (CKD), or fly ash to achieve certain desirable soil characteristics.

Equivalent BMPs means operational, source control, treatment, or innovative BMPs which result in equal or better quality of stormwater discharge to surface water or to ground water than BMPs selected from the SWMM.

Erosion means the wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep.

Erosion and Sediment Control BMPs means BMPs intended to prevent erosion and sedimentation, such as preserving natural vegetation, seeding, mulching and matting, plastic covering, filter fences, sediment traps, and ponds. Erosion and sediment control BMPs are synonymous with stabilization and structural BMPs.

Final Stabilization (same as fully stabilized or full stabilization) means the establishment of a permanent vegetative cover, or equivalent permanent stabilization measures (such as riprap, gabions or geotextiles) which prevents erosion.

Ground Water means water in a saturated zone or stratum beneath the land surface or a surface water body.

Hazardous Substance means any dangerous or extremely hazardous waste as defined in RCW 70.105.010 (5) and (6), or any dangerous or extremely dangerous waste as designated by rule under chapter 70.105 RCW; any hazardous sub-stance as defined in RCW 70.105.010(14) or any hazardous substance as defined by rule under chapter 70.105 RCW; any substance that, on the effective date of this section, is a hazardous substance under section 101(14) of the federal cleanup law, 42 U.S.C., Sec. 9601(14); petroleum or petroleum products; and any substance or category of substances, including solid waste decomposition products, determined by the director by rule to present a threat to human health or the environment if released into the environment. The term hazardous substance does not include any of the following when contained in an underground storage tank from which there is not a release: crude oil or any fraction thereof or petroleum, if the tank is in compliance with all applicable federal, state, and local law.

Injection Well means a well that is used for the subsurface emplacement of fluids. (See Well.)

Jurisdiction means a political unit such as a city, town or county; incorporated for local self-government.

National Pollutant Discharge Elimination System (NPDES) means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring, and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of the Federal Clean Water Act, for the discharge of pollutants to surface waters of the State from point sources. These permits are referred to as NPDES permits and, in Washington State, are administered by the Washington Department of Ecology.

Notice of Intent (NOI) means the application for, or a request for coverage under this general permit pursuant to WAC 173-226-200.

Notice of Termination (NOT) means a request for termination of coverage under this general permit as specified by Special Condition S10 of this permit.

Operator means any party associated with a construction project that meets either of the following two criteria:

- The party has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or
- The party has day-to-day operational control of those activities at a project that are necessary to ensure compliance with a SWPPP for the site or other permit conditions (e.g., they are authorized to direct workers at a site to carry out activities required by the SWPPP or comply with other permit conditions).

Permittee means individual or entity that receives notice of coverage under this general permit.

pH means a liquid's measure of acidity or alkalinity. A pH of 7 is defined as neutral. Large variations above or below this value are considered harmful to most aquatic life.

pH monitoring period means the time period in which the pH of stormwater runoff from a site must be tested a minimum of once every seven days to determine if stormwater pH is between 6.5 and 8.5.

Point source means any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, and container from which pollutants are or may be discharged to surface waters of the State. This term does not include return flows from irrigated agriculture. (See Fact Sheet for further explanation.)

Pollutant means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, domestic sewage sludge (biosolids), munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste. This term does not include sewage from vessels within the meaning of section 312 of the CWA, nor does it include dredged or fill material discharged in accordance with a permit issued under section 404 of the CWA.

Pollution means contamination or other alteration of the physical, chemical, or biological properties of waters of the State; including change in temperature, taste, color, turbidity, or odor of the waters; or such discharge of any liquid, gaseous, solid, radioactive or other substance into any waters of the State as will or is likely to create a nuisance or render such waters harmful, detrimental or injurious to the public health, safety or welfare; or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses; or to livestock, wild animals, birds, fish or other aquatic life.

Process wastewater means any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product (40 CFR 122.1).

Receiving water means the water body at the point of discharge. If the discharge is to a storm sewer system, either surface or subsurface, the receiving water is the water body to which the storm system discharges. Systems designed primarily for other purposes such as for ground water drainage, redirecting stream natural flows, or for conveyance of irrigation water/return flows that coincidentally convey stormwater are considered the receiving water.

Representative means a stormwater or wastewater sample which represents the flow and characteristics of the discharge. Representative samples may be a grab sample, a time-proportionate composite sample, or a flow proportionate sample. Ecology's Construction Stormwater Monitoring Manual provides guidance on representative sampling.

Sanitary sewer means a sewer which is designed to convey domestic wastewater.

Sediment means the fragmented material that originates from the weathering and erosion of rocks or unconsolidated deposits, and is transported by, suspended in, or deposited by water.

Sedimentation means the depositing or formation of sediment.

Sensitive area means a water body, wetland, stream, aquifer recharge area, or channel migration zone.

SEPA (State Environmental Policy Act) means the Washington State Law, RCW 43.21C.020, intended to prevent or eliminate damage to the environment.

Significant Amount means an amount of a pollutant in a discharge that is amenable to available and reasonable methods of prevention or treatment; or an amount of a pollutant that has a reasonable potential to cause a violation of surface or ground water quality or sediment management standards.

Significant concrete work means greater than 1000 cubic yards poured concrete or recycled concrete over the life of a project.

Significant Contributor of Pollutants means a facility determined by Ecology to be a contributor of a significant amount(s) of a pollutant(s) to waters of the State of Washington.

Site means the land or water area where any "facility or activity" is physically located or conducted.

Source control BMPs means physical, structural or mechanical devices or facilities that are intended to prevent pollutants from entering stormwater. A few examples of source control BMPs are erosion control practices, maintenance of stormwater facilities, constructing roofs over storage and working areas, and directing wash water and similar discharges to the sanitary sewer or a dead end sump.

Stabilization means the application of appropriate BMPs to prevent the erosion of soils, such as, temporary and permanent seeding, vegetative covers, mulching and matting, plastic covering and sodding. See also the definition of Erosion and Sediment Control BMPs.

Storm drain means any drain which drains directly into a storm sewer system, usually found along roadways or in parking lots.

Storm sewer system means a means a conveyance, or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains designed or used for collecting or conveying stormwater. This does not include systems which are part of a combined sewer or Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

Stormwater means that portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a stormwater drainage system into a defined surface water body, or a constructed infiltration facility.

Stormwater Management Manual (SWMM) or Manual means the technical Manual published by Ecology for use by local governments that contain descriptions of and design criteria for BMPs to prevent, control, or treat pollutants in stormwater.

Stormwater Pollution Prevention Plan (SWPPP) means a documented plan to implement measures to identify, prevent, and control the contamination of point source discharges of stormwater.

Surface Waters of the State includes lakes, rivers, ponds, streams, inland waters, salt waters, and all other surface waters and water courses within the jurisdiction of the state of Washington.

Temporary Stabilization means the exposed ground surface has been covered with appropriate materials to provide temporary stabilization of the surface from water or wind erosion. Materials include, but are not limited to, mulch, riprap, erosion control mats or blankets and temporary cover crops. Seeding alone is not considered stabilization. Temporary stabilization is not a substitute for the more permanent ―final stabilization.”

Total Maximum Daily Load (TMDL) means a calculation of the maximum amount of a pollutant that a water body can receive and still meet state water quality standards. Percentages of the total maximum daily load are allocated to the various pollutant sources. A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The TMDL calculations must include a "margin of safety" to ensure that the water body can be protected in case there are unforeseen events or unknown sources of the pollutant. The calculation must also account for seasonable variation in water quality.

Treatment BMPs means BMPs that are intended to remove pollutants from stormwater. A few examples of treatment BMPs are detention ponds, oil/water separators, biofiltration, and constructed wetlands.

Transparency means a measurement of water clarity in centimeters (cm), using a 60 cm transparency tube. The transparency tube is used to estimate the relative clarity or transparency of water by noting the depth at which a black and white Secchi disc becomes visible when water is released from a value in the bottom of the tube. A transparency tube is sometimes referred to as a ―turbidity tube.”

Turbidity means the clarity of water expressed as nephelometric turbidity units (NTU) and measured with a calibrated turbidimeter.

Uncontaminated means free from any contaminant, as defined in MTCA cleanup regulations. See definition of ―contaminant” and WAC 173-340-200.

Waste Load Allocation (WLA) means the portion of a receiving water’s loading capacity that is allocated to one of its existing or future point sources of pollution. WLAs constitute a type of water quality based effluent limitation (40 CFR 130.2[h]).

Water quality means the chemical, physical, and biological characteristics of water, usually with respect to its suitability for a particular purpose.

Waters of the State includes those waters as defined as "waters of the United States" in 40 CFR Subpart 122.2 within the geographic boundaries of Washington State and "waters of the State" as defined in Chapter 90.48 RCW, which include lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and water courses within the jurisdiction of the state of Washington.

Well means a bored, drilled or driven shaft, or dug hole whose depth is greater than the largest surface dimension. (See Injection well.)

Wheel wash wastewater means any water used in, or resulting from the operation of, a tire bath or wheel wash (BMP C106: Wheel Wash), or other structure or practice that uses water to physically remove mud and debris from vehicles leaving a construction site and prevent track-out onto roads. When stormwater comingles with wheel wash wastewater, the resulting water is considered wheel wash wastewater and must be managed according to Special Condition S9.D.9.

APPENDIX B – ACRONYMS

AKART	All Known, Available, and Reasonable Methods of Prevention, Control, and Treatment
BMP	Best Management Practice
CESCL	Certified Erosion and Sediment Control Lead
CFR	Code of Federal Regulations
CKD	Cement Kiln Dust
cm	Centimeters
CTB	Cement-Treated Base
CWA	Clean Water Act
DMR	Discharge Monitoring Report
EPA	Environmental Protection Agency
ESC	Erosion and Sediment Control
FR	Federal Register
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit
RCW	Revised Code of Washington
SEPA	State Environmental Policy Act
SWMM	Stormwater Management Manual
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
UIC	Underground Injection Control
USC	United States Code
USEPA	United States Environmental Protection Agency
WAC	Washington Administrative Code
WQ	Water Quality
WWHM	Western Washington Hydrology Model

Appendix E – Site Inspection Forms (and Site Log)

The results of each inspection shall be summarized in an inspection report or checklist that is entered into or attached to the site log book. It is suggested that the inspection report or checklist be included in this appendix to keep monitoring and inspection information in one document, but this is optional. However, it is mandatory that this SWPPP and the site inspection forms be kept onsite at all times during construction, and that inspections be performed and documented as outlined below.

At a minimum, each inspection report or checklist shall include:

a. Inspection date/times

b. Weather information: general conditions during inspection, approximate amount of precipitation since the last inspection, and approximate amount of precipitation within the last 24 hours.

c. A summary or list of all BMPs that have been implemented, including observations of all erosion/sediment control structures or practices.

d. The following shall be noted:

   i. locations of BMPs inspected,

   ii. locations of BMPs that need maintenance,

   iii. the reason maintenance is needed,

   iv. locations of BMPs that failed to operate as designed or intended, and

   v. locations where additional or different BMPs are needed, and the reason(s) why

e. A description of stormwater discharged from the site. The presence of suspended sediment, turbid water, discoloration, and/or oil sheen shall be noted, as applicable.

f. A description of any water quality monitoring performed during inspection, and the results of that monitoring.

g. General comments and notes, including a brief description of any BMP r repairs, maintenance or installations made as a result of the inspection.

h. A statement that, in the judgment of the person conducting the site inspection, the site is either in compliance or out of compliance with the terms and conditions of the SWPPP and the NPDES permit. If the site inspection indicates that the site is out of compliance, the inspection report shall include a summary of the remedial actions required to bring the site back into compliance, as well as a schedule of implementation.

i. Name, title, and signature of person conducting the site inspection; and the following statement: "I certify under penalty of law that this report is true, accurate, and complete, to the best of my knowledge and belief".

When the site inspection indicates that the site is not in compliance with any terms and conditions of the NPDES permit, the Permittee shall take immediate action(s) to: stop, contain, and clean up the unauthorized discharges, or otherwise stop the noncompliance; correct the problem(s); implement appropriate Best Management Practices (BMPs), and/or conduct maintenance of existing BMPs; and achieve compliance with all applicable standards and permit conditions. In addition, if the noncompliance causes a threat to human health or the environment, the Permittee shall comply with the Noncompliance Notification requirements in Special Condition S5.F of the permit.

- ☐ The following provides a basis for a site inspection form. This particular form is optional and not required. However, if this form or a similar form is not used, the site inspection information required under this SWPPP and General Permit must still be included in the site log book. This form may be edited, replicated, and placed in this Appendix to function as the site log book for inspection and monitoring requirements. This will keep all SWPPP and monitoring information for the construction site in the same location for easy reference.

Site Inspection Form

General Information			
Project Name:			
Inspector Name:		**Title:** **CESCL # :**	
Date:		**Time:**	
Inspection Type:	☐ After a rain event ☐ Weekly ☐ Turbidity/transparency benchmark exceedance ☐ Other		
Weather			
Precipitation	Since last inspection		In last 24 hours
Description of General Site Conditions:			

Inspection of BMPs
Element 1: Mark Clearing Limits
BMP:

Location	Inspected Y	Inspected N	Functioning Y	Functioning N	Functioning NIP	Problem/Corrective Action

BMP:

Location	Inspected Y	Inspected N	Functioning Y	Functioning N	Functioning NIP	Problem/Corrective Action

Location	Inspected			Functioning			Problem/Corrective Action

Element 2: Establish Construction Access

BMP:

Location	Inspected Y	N		Functioning Y	N	NIP	Problem/Corrective Action

BMP:

Location	Inspected Y	N		Functioning Y	N	NIP	Problem/Corrective Action

Element 3: Control Flow Rates

BMP:

Location	Inspected Y	N		Functioning Y	N	NIP	Problem/Corrective Action

BMP:

Location	Inspected Y	N		Functioning Y	N	NIP	Problem/Corrective Action

Element 4: Install Sediment Controls

BMP:

Location	Inspected Y	N		Functioning Y	N	NIP	Problem/Corrective Action

BMP:

Location	Inspected Y	N		Functioning Y	N	NIP	Problem/Corrective Action

BMP:

Location	Inspected Y	N		Functioning Y	N	NIP	Problem/Corrective Action

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
Element 5: Stabilize Soils						
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
Element 6: Protect Slopes						
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 7: Protect Drain Inlets

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 8: Stabilize Channels and Outlets

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 9: Control Pollutants

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 10: Control Dewatering

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:			
Location	Inspected	Functioning	Problem/Corrective Action

	Y	N		Y	N	NIP

Stormwater Discharges From the Site			
	Observed?		Problem/Corrective Action
	Y	N	
Location			
Turbidity			
Discoloration			
Sheen			
Location			
Turbidity			
Discoloration			
Sheen			

Water Quality Monitoring		
Was any water quality monitoring conducted?	□ Yes	□ No
If water quality monitoring was conducted, record results here:		
If water quality monitoring indicated turbidity 250 NTU or greater; or transparency 6 cm or less, was Ecology notified by phone within 24 hrs?	□ Yes	□ No
If Ecology was notified, indicate the date, time, contact name and phone number below:		
Date:		
Time:		
Contact Name:		
Phone #:		
General Comments and Notes		
Include BMP repairs, maintenance, or installations made as a result of the inspection.		
Were Photos Taken?	□ Yes	□ No
If photos taken, describe photos below:		

Appendix F – Engineering Calculations

WWHM2012
PROJECT REPORT

Project Name: Aladdin Plating
Site Name: Aladdin Plating
Site Address: 1657 Center Street
City : Tacoma
Report Date: 6/3/2015
Gage :
Data Start : 10/01/1901
Data End : 09/30/2059
Precip Scale: 1.00
Version : 2014/11/26

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	Acres
C, Forest, Flat	.055

Pervious Total 0.055

Impervious Land Use	Acres

Impervious Total 0

Basin Total 0.055

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	Acres

Pervious Total	0

Impervious Land Use	Acres
ROADS FLAT	0.055
Impervious Total	0.055
Basin Total	0.055

Element Flows To:

Surface	Interflow	Groundwater

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:0.055
Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:0
Total Impervious Area:0.055

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.001159
5 year	0.001803
10 year	0.002153
25 year	0.002509
50 year	0.002721
100 year	0.002895

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.019275
5 year	0.025873
10 year	0.030669
25 year	0.037232
50 year	0.0425
100 year	0.048102

Stream Protection Duration

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1902	0.001	0.023
1903	0.001	0.025
1904	0.001	0.029
1905	0.001	0.013
1906	0.000	0.014
1907	0.002	0.019
1908	0.001	0.016
1909	0.001	0.019
1910	0.002	0.019
1911	0.001	0.021
1912	0.004	0.035
1913	0.002	0.015
1914	0.000	0.063
1915	0.001	0.013
1916	0.001	0.024
1917	0.000	0.009
1918	0.001	0.019
1919	0.001	0.012
1920	0.001	0.016
1921	0.001	0.014
1922	0.001	0.021
1923	0.001	0.015
1924	0.000	0.028
1925	0.001	0.012
1926	0.001	0.023
1927	0.001	0.019
1928	0.001	0.014
1929	0.002	0.028
1930	0.001	0.029
1931	0.001	0.014
1932	0.001	0.015
1933	0.001	0.015
1934	0.002	0.024
1935	0.001	0.013
1936	0.001	0.018
1937	0.002	0.027
1938	0.001	0.013
1939	0.000	0.016
1940	0.001	0.029
1941	0.001	0.029
1942	0.002	0.022
1943	0.001	0.021
1944	0.001	0.031
1945	0.001	0.023
1946	0.001	0.018
1947	0.000	0.014
1948	0.002	0.019
1949	0.002	0.030
1950	0.001	0.017
1951	0.001	0.026
1952	0.003	0.029
1953	0.003	0.026
1954	0.001	0.016
1955	0.001	0.015
1956	0.000	0.014

1957	0.002	0.016
1958	0.003	0.019
1959	0.002	0.019
1960	0.001	0.015
1961	0.002	0.044
1962	0.001	0.019
1963	0.001	0.014
1964	0.001	0.041
1965	0.002	0.018
1966	0.001	0.015
1967	0.001	0.021
1968	0.001	0.018
1969	0.001	0.016
1970	0.001	0.018
1971	0.002	0.018
1972	0.002	0.059
1973	0.002	0.034
1974	0.001	0.025
1975	0.002	0.026
1976	0.001	0.027
1977	0.000	0.012
1978	0.002	0.020
1979	0.001	0.021
1980	0.001	0.021
1981	0.001	0.019
1982	0.000	0.016
1983	0.002	0.021
1984	0.001	0.021
1985	0.001	0.024
1986	0.001	0.012
1987	0.002	0.022
1988	0.001	0.013
1989	0.001	0.012
1990	0.001	0.015
1991	0.001	0.023
1992	0.002	0.022
1993	0.002	0.025
1994	0.002	0.017
1995	0.000	0.013
1996	0.003	0.018
1997	0.001	0.016
1998	0.001	0.019
1999	0.000	0.021
2000	0.001	0.018
2001	0.000	0.015
2002	0.002	0.027
2003	0.001	0.016
2004	0.001	0.023
2005	0.002	0.044
2006	0.001	0.021
2007	0.001	0.023
2008	0.001	0.019
2009	0.001	0.015
2010	0.001	0.019
2011	0.001	0.020
2012	0.001	0.018
2013	0.001	0.017

2014	0.000	0.017
2015	0.001	0.028
2016	0.000	0.018
2017	0.002	0.028
2018	0.003	0.017
2019	0.003	0.025
2020	0.001	0.021
2021	0.002	0.017
2022	0.001	0.029
2023	0.001	0.036
2024	0.003	0.039
2025	0.001	0.019
2026	0.002	0.021
2027	0.001	0.023
2028	0.001	0.009
2029	0.001	0.015
2030	0.002	0.030
2031	0.001	0.009
2032	0.000	0.016
2033	0.001	0.020
2034	0.001	0.016
2035	0.003	0.019
2036	0.001	0.016
2037	0.000	0.021
2038	0.001	0.020
2039	0.000	0.040
2040	0.001	0.016
2041	0.001	0.020
2042	0.003	0.023
2043	0.001	0.025
2044	0.002	0.017
2045	0.001	0.014
2046	0.001	0.016
2047	0.001	0.019
2048	0.001	0.016
2049	0.001	0.024
2050	0.001	0.018
2051	0.001	0.025
2052	0.001	0.019
2053	0.001	0.016
2054	0.002	0.032
2055	0.001	0.020
2056	0.001	0.025
2057	0.001	0.012
2058	0.001	0.024
2059	0.002	0.030

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	**Predeveloped**	**Mitigated**
1	0.0039	0.0632
2	0.0033	0.0590
3	0.0032	0.0444
4	0.0031	0.0438
5	0.0030	0.0405
6	0.0029	0.0400

7	0.0028	0.0389
8	0.0027	0.0364
9	0.0025	0.0346
10	0.0025	0.0343
11	0.0025	0.0320
12	0.0025	0.0306
13	0.0025	0.0299
14	0.0024	0.0298
15	0.0024	0.0296
16	0.0024	0.0294
17	0.0023	0.0289
18	0.0022	0.0289
19	0.0022	0.0286
20	0.0022	0.0286
21	0.0021	0.0286
22	0.0020	0.0283
23	0.0020	0.0282
24	0.0019	0.0281
25	0.0019	0.0276
26	0.0019	0.0273
27	0.0019	0.0267
28	0.0018	0.0266
29	0.0018	0.0265
30	0.0018	0.0256
31	0.0018	0.0255
32	0.0018	0.0254
33	0.0018	0.0253
34	0.0016	0.0252
35	0.0016	0.0252
36	0.0016	0.0251
37	0.0016	0.0248
38	0.0016	0.0248
39	0.0016	0.0243
40	0.0015	0.0242
41	0.0015	0.0241
42	0.0015	0.0238
43	0.0015	0.0236
44	0.0015	0.0233
45	0.0014	0.0233
46	0.0014	0.0232
47	0.0014	0.0232
48	0.0014	0.0232
49	0.0014	0.0229
50	0.0014	0.0229
51	0.0013	0.0228
52	0.0013	0.0220
53	0.0013	0.0215
54	0.0013	0.0215
55	0.0013	0.0213
56	0.0013	0.0213
57	0.0013	0.0213
58	0.0013	0.0213
59	0.0013	0.0212
60	0.0013	0.0210
61	0.0013	0.0209
62	0.0013	0.0209
63	0.0013	0.0208

64	0.0012	0.0208
65	0.0012	0.0208
66	0.0012	0.0205
67	0.0012	0.0205
68	0.0012	0.0200
69	0.0012	0.0199
70	0.0012	0.0199
71	0.0012	0.0198
72	0.0012	0.0198
73	0.0012	0.0196
74	0.0012	0.0195
75	0.0012	0.0194
76	0.0012	0.0193
77	0.0012	0.0193
78	0.0012	0.0193
79	0.0011	0.0193
80	0.0011	0.0193
81	0.0011	0.0192
82	0.0011	0.0192
83	0.0011	0.0192
84	0.0011	0.0191
85	0.0011	0.0189
86	0.0011	0.0189
87	0.0011	0.0188
88	0.0011	0.0188
89	0.0010	0.0186
90	0.0010	0.0186
91	0.0010	0.0184
92	0.0010	0.0184
93	0.0010	0.0182
94	0.0010	0.0182
95	0.0010	0.0180
96	0.0010	0.0180
97	0.0009	0.0179
98	0.0009	0.0179
99	0.0009	0.0179
100	0.0009	0.0176
101	0.0009	0.0176
102	0.0009	0.0174
103	0.0009	0.0173
104	0.0009	0.0173
105	0.0009	0.0172
106	0.0009	0.0169
107	0.0008	0.0169
108	0.0008	0.0168
109	0.0008	0.0164
110	0.0008	0.0162
111	0.0008	0.0161
112	0.0008	0.0161
113	0.0008	0.0159
114	0.0007	0.0159
115	0.0007	0.0158
116	0.0007	0.0158
117	0.0007	0.0157
118	0.0007	0.0157
119	0.0007	0.0157
120	0.0007	0.0156

121	0.0007	0.0156
122	0.0007	0.0156
123	0.0007	0.0156
124	0.0007	0.0155
125	0.0007	0.0155
126	0.0007	0.0153
127	0.0007	0.0152
128	0.0006	0.0151
129	0.0006	0.0150
130	0.0006	0.0149
131	0.0006	0.0149
132	0.0006	0.0148
133	0.0006	0.0147
134	0.0006	0.0146
135	0.0006	0.0146
136	0.0006	0.0144
137	0.0006	0.0143
138	0.0005	0.0141
139	0.0005	0.0140
140	0.0005	0.0140
141	0.0005	0.0139
142	0.0005	0.0138
143	0.0005	0.0136
144	0.0005	0.0134
145	0.0005	0.0130
146	0.0005	0.0130
147	0.0005	0.0128
148	0.0004	0.0128
149	0.0004	0.0128
150	0.0004	0.0124
151	0.0004	0.0122
152	0.0004	0.0119
153	0.0004	0.0117
154	0.0003	0.0117
155	0.0002	0.0117
156	0.0001	0.0094
157	0.0001	0.0092
158	0.0001	0.0091

Perlnd and Implnd Changes

No changes have been made.

Temporary Runoff Storage Calculation

Site Area:	2,400	sq. ft.	
	0.055	acres	
Q_{2yr} =	0.019	cfs	(See attached WWHM Calculation)

Temporary construction runoff storage will be provide via portable tanks. The recommended minimum volume of storage has been estimated by the equivalent volume required for a sediment pond. The contractor should monitor the weather predictions and adjust the volume as necessary based on conditions observed in the field.

2012 DOE; BMP C241: Temporary Sediment Pond

Determine the required surface area at the top of the riser pipe with the equation:

$SA = 2 \times Q_2/0.00096$ or
2080 square feet per cfs of inflow

Minimum 3.5-foot depth from top of riser to bottom of pond.

Therefore;

Volume =	2,080 x 0.02 cfs x 3.5 ft =	145.6	cubic ft.
	=	1,090	gallons

Poly Tanks are available for rent in multiple sizes. Common sizes are 4,000 gallons. The 4,000 gallon tank should provide sufficient storage for low-level rain storms. The tank should be tested (monitored) and emptied prior to reaching 3/4 capacity to accomodate capactiy for future rain events during the testing period. If groundwater is encountered or unusually heavy periods of rain occur additional storage may be necessary.

Appendix G – Remedial Investigation Report

ATTACHMENT 6
Preliminary Landfill Use Authorizations

REPUBLIC SERVICES

SPECIAL WASTE PROFILE

PRINT

Waste Profile #
Sales Rep #:

Requested Disposal Facility: 4178 Roosevelt Regional MSW LF WA

Saveable fill-in form. Restricted printing until all required (yellow) fields are completed.

I. Generator Information

Generator Name: Washington State Department of Ecology			
Generator Site Address: 1657 Center Street			
City: Tacoma	County: Pierce	State: Washington	Zip: 98409
State ID/Reg No: FSID 1277	State Approval/Waste Code: (if applicable)		NAICS # :
Generator Mailing Address (if different): ☑ 600 Stewart Street, Suite 1700			
City: Seattle	County: King	State: Washington	Zip: 98101
Generator Contact Name: Ian Young - GeoEngineers. Inc.		Email: iyoung@geoengineers.com	
Phone Number: (206) 518-5142	Ext:	Fax Number: (206) 728-2732	

II. Billing Information

Bill To: TBD		Contact Name:	
Billing Address:		Email:	
City:	State:	Zip:	Phone:

III. Waste Stream Information

Name of Waste:	Metals contaminated soil
Process Generating Waste:	Remedial action at 1657 Center Street - Former Aladdin Plating (Site). Past Site use includes light industrial activities (metal plating). Remedial action includes excavation of metals-contaminated soil.
Type of Waste:	☐ INDUSTRIAL PROCESS WASTE ☑ POLLUTION CONTROL WASTE
Physical State:	☑ SOLID ☐ SEMI-SOLID ☐ POWDER ☐ LIQUID
Method of Shipment:	☑ BULK ☐ DRUM ☐ BAGGED ☐ OTHER:
Estimated Annual Volume:	680 Tons
Frequency:	☑ ONE TIME ☐ ONGOING
Disposal Consideration:	☑ LANDFILL ☐ SOLIDIFICATION ☐ BIOREMEDIATION

IV. Representative Sample Certification

☐ NO SAMPLE TAKEN

Is the representative sample collected to prepare this profile and laboratory analysis, collected in accordance with U.S. EPA 40 CFR 261.20(c) guidelines or equivalent rules?	☑ YES or ☐ NO
Type of Sample: ☐ COMPOSITE SAMPLE ☑ GRAB SAMPLE	
Sample Date: 3/24/2014	
Sample ID Numbers: SB-1 through SB-14 (see attached summary table)	

Waste Profile #

V. Physical Characteristics of Waste

Characteristic Components	% by Weight (range)
1. Soil	99.75
2. Metals (chromium, lead, and nickel)	0.25
3.	
4.	
5.	

Color	Odor (describe)	Does Waste Contain Free Liquids?	% Solids	pH:	Flash Point
Brown	None	☐ YES or ☑ NO	99		°F

Attach Laboratory Analytical Report (and/or Material Safety Data Sheet) Including Chain of Custody and Required Parameters Provided for this Profile

Does this waste or generating process contain regulated concentrations of the following Pesticides and/or Herbicides: Chlordane, Endrin, Heptachlor (and its epoxides), Lindane, Methoxychlor, Toxaphene, 2,4-D, or 2,4,5-TP Silvex as defined in 40 CFR 261.33?	☐ Yes or ☑ No
Does this waste contain reactive sulfides (greater than 500 ppm) or reactive cyanide (greater than 250 ppm)[reference 40 CFR 261.23(a)(5)]?	☐ Yes or ☑ No
Does this waste contain regulated concentrations of Polychlorinated Biphenyls (PCBs) as defined in 40 CFR Part 761?	☐ Yes or ☑ No
Does this waste contain concentrations of listed hazardous wastes defined in 40 CFR 261.31, 261.32, 261.33, including RCRA F-Listed Solvents?	☐ Yes or ☑ No
Does this waste exhibit a Hazardous Characteristic as defined by Federal and/or State regulations?	☐ Yes or ☑ No
Does this waste contain regulated concentrations of 2,3,7,8-Tetrachlorodibenzodioxin (2,3,7,8-TCCD), or any other dioxin as defined in 40 CFR 261.31?	☐ Yes or ☑ No
Is this a regulated Radioactive Waste as defined by Federal and/or State regulations?	☐ Yes or ☑ No
Is this a regulated Medical or Infectious Waste as defined by Federal and/or State regulations?	☐ Yes or ☑ No
Is this waste a reactive or heat generating waste?	☐ Yes or ☑ No
Does the waste contain sulfur or sulfur by-products?	☐ Yes or ☑ No
Is this waste generated at a Federal Superfund Clean Up Site?	☐ Yes or ☑ No
Is this waste from a TSD facility, TSD like facility or consolidator?	☐ Yes or ☑ No

VI. Certification

I hereby certify that to the best of my knowledge and belief, the information contained herein is a true, complete and accurate description of the waste material being offered for disposal and all known or suspected hazards have been disclosed. All Analytical Results/Material Safety Data Sheets submitted are truthful and complete and are representative of the waste.

I further certify that by utilizing this profile, neither myself nor any other employee of the company will deliver for disposal or attempt to deliver for disposal any waste which is classified as toxic waste, hazardous waste or infectious waste, or any other waste material this facility is prohibited from accepting by law. I shall immediately give written notice of any change or condition pertaining to the waste not provided herein. Our company hereby agrees to fully indemnify this disposal facility against any damages resulting from this certification being inaccurate or untrue.

I further certify that the company has not altered the form or content of this profile sheet as provided by Republic Services Inc.

Ian Young	GeoEngineers, Inc.
Authorized Representative Name And Title (Type or Print)	Company Name
	8/17/2015
Authorized Representative Signature	Date

Waste Management Profile

WASTE MANAGEMENT

Requested Facility: ____ ☑ Unsure Profile Number: ____

☐ Check if there are multiple generator locations. Attach locations. ☐ Renewal? Original Profile Number: ____

A. GENERATOR INFORMATION (MATERIAL ORIGIN)

1. Generator Name: Washington State Department of Ecology
2. Site Address: 1657 Center Street
   (City, State, ZIP) Tacoma WA 98409
3. County: Pierce
4. Contact Name: Ian Young
5. Email: iyoung@geoengineers.com
6. Phone: 206.518.5142 7. Fax: 206.728.2732
8. Generator EPA ID: ____ ☑ N/A
9. State ID: FSID 1277 ☐ N/A

B. BILLING INFORMATION ☐ SAME AS GENERATOR

1. Billing Name: TBD
2. Billing Address: ____
   (City, State, ZIP) ____
3. Contact Name: ____
4. Email: ____
5. Phone: ____ 6. Fax: ____
7. WM Hauled? ☐ Yes ☐ No
8. P.O. Number: ____

C. MATERIAL INFORMATION

1. Common Name: Metals-contaminated soil
   Describe Process Generating Material: ☐ See Attached

Remedial action at 1657 Center Street - Former Aladdin Plating (Site). Past Site use includes light industrial activities (metal plating). Remedial action includes excavation of metals-contaminated soil.

2. Material Composition and Contaminants: ☐ See Attached

1. Soil	99.75
2. Metals - contaminants include chromium, lead, and nickel	0.25
3.	
4.	
	≥100%

3. State Waste Codes: ____ ☐ N/A
4. Color: Brown
5. Physical State at 70°F: ☑ Solid ☐ Liquid ☐ Other: ____
6. Free Liquid Range Percentage: ____ to ____ ☑ N/A (Solid)
7. pH: ____ to ____ ☑ N/A (Solid)
8. Strong Odor: ☐ Yes ☑ No Describe: ____
9. Flash Point: ☐ <140°F ☐ 140°–199°F ☐ ≥200° ☑ N/A (Solid)

D. REGULATORY INFORMATION

1. EPA Hazardous Waste? ☐ Yes* ☑ No
   Code: ____
2. State Hazardous Waste? ☐ Yes ☑ No
   Code: ____
3. Excluded waste under 40 CFR 261.4 (a) or (b)? ☐ Yes* ☑ No
4. Contains Underlying Hazardous Constituents? ☑ Yes* ☐ No
5. Contains benzene **and** subject to Benzene NESHAP? ☐ Yes* ☑ No
6. Facility remediation subject to 40 CFR 63 GGGGG? ☐ Yes* ☑ No
7. CERCLA or State-mandated clean-up? ☐ Yes* ☑ No
8. NRC or State-regulated radioactive or NORM waste? ☐ Yes* ☑ No

***If Yes, see Addendum (page 2) for additional questions and space.**

9. Contains PCBs? → If Yes, answer a, b and c. ☐ Yes ☑ No
   a. Regulated by 40 CFR 761? ☐ Yes ☑ No
   b. Remediation under 40 CFR 761.61 (a)? ☐ Yes ☑ No
   c. Were PCB imported into the US? ☐ Yes ☑ No
10. Regulated and/or Untreated Medical/Infectious Waste? ☐ Yes ☑ No
11. Contains Asbestos? ☐ Yes: Friable ☐ Yes: Non-Friable ☑ No

E. ANALYTICAL AND OTHER REPRESENTATIVE INFORMATION

1. Analytical attached ☑ Yes
   Please identify applicable samples and/or lab reports:

Soil samples SB-1 through SB-14 (see attached summary table)

2. Other information attached (such as MSDS)? ☐ Yes

F. SHIPPING AND DOT INFORMATION

1. ☑ One-Time Event ☐ Repeat Event/Ongoing Business
2. Estimated Quantity/Unit of Measure: ____
   ☑ Tons ☐ Yards ☐ Drums ☐ Gallons ☐ Other: 680
3. Container Type and Size: TBD
4. USDOT Proper Shipping Name: ☑ N/A

G. GENERATOR CERTIFICATION (PLEASE READ AND CERTIFY BY SIGNATURE)

By signing this Waste Management Profile, I hereby certify that all information submitted in this and all attached documents contain true and accurate descriptions of this material, and that all relevant information necessary for proper material characterization and to identify known and suspected hazards has been provided. Any analytical data attached was derived from a sample that is representative as defined in 40 CFR 261 - Appendix 1 or by using an equivalent method. All changes occurring in the character of the material (i.e., changes in the process or new analytical) will be identified by the Generator and be disclosed to Waste Management prior to providing the material to Waste Management.

If I am an agent signing on behalf of the Generator, I have confirmed with the Generator that information contained in this Profile is accurate and complete.

Name (Print): Ian Young Date: 8/17/2015

Title: Project Geologist

Company: GeoEngineers, Inc.

Certification Signature

Waste Management Profile Addendum

WASTE MANAGEMENT

Only complete this Addendum if prompted by responses on Waste Management Profile (page 1) or to provide additional information. Sections and question numbers correspond to Waste Management Profile.

Profile Number: ______________

SECTION C

Describe Process Generating Material (Continued from page 1): If more space is needed, please attach additional pages.

Material Composition and Contaminants (Continued from page 1): If more space is needed, please attach additional pages.

5.	
6.	
7.	
8.	
9.	
10.	
	≥100%

SECTION D

Only questions with a "Yes" response on Waste Management Profile (page 1) need to be answered here.

1. EPA Hazardous Waste
   a. Please list all USEPA listed and characteristic waste code numbers:
   b. Is the material subject to the Alternative Debris standards (40 CFR 268.45)? ❑ Yes ❑ No
   c. Is the material subject to the Alternative Soil standards (40 CFR 268.49)? → If Yes, complete question 4. ❑ Yes ❑ No
   d. Is the material exempt from Subpart CC Controls (40 CFR 264.1083 and 265.1084)? ❑ Yes ❑ No
      → If Yes, please select one of the following:
      ❑ Waste has been determined to be LDR exempt [265.1083(c)(4) and 265.1084(c)(4)] based on the fact that it meets all applicable organic treatment standards (including UHCs for D-coded characteristic wastes) or a Specified Technology has been utilized.
      ❑ Waste does not qualify for a LDR exemption, but the average VOC at the point of origination is <500 ppmw and this determination was based on analytical testing (upload copy of analysis) or generator knowledge.
2. State Hazardous Waste → Please list all state waste codes: ______________
3. Excluded Waste → Please select which of the following categories apply to your material:
   ❑ Delisted Hazardous Waste ❑ Excluded Waste under 40 CFR 261.4 → Specify Exclusion: ______________
   ❑ Treated Hazardous Waste Debris ❑ Treated Characteristic Hazardous Waste → If checked, complete question 4.
4. Underlying Hazardous Constituents → Please list all Underlying Hazardous Constituents:
   Concentrations of chromium VI and nickel may qualify as dangerous wastes. Stockpile testing prior to off-site export will determine designation.
5. Benzene NESHAP → Please include benzene concentration and percent water/moisture in chemical composition.
   a. Are you a TSDF? → If yes, please complete Benzene NESHAP questionnaire. If not, continue.
   b. What is your facility's current total annual benzene quantity in Megagrams? ❑ <1 Mg ❑ 1–9.99 Mg ❑ ≥10 Mg
   c. Is this waste soil from remediation at a closed facility? ❑ Yes ❑ No
   d. Has material been treated to remove 99% of the benzene or to achieve <10 ppmw? ❑ Yes ❑ No
   e. Is material exempt from controls in accordance with 40 CFR 61.342? ❑ Yes ❑ No
      → If yes, specify exemption: ______________
   f. Based on your knowledge of your waste and the BWON regulations, do you believe that this waste stream is subject to treatment and control requirements at an off-site TSDF? ❑ Yes ❑ No
6. 40 CFR 63 GGGGG → Does the material contain <500 ppw VOHAPs at the point of determination? ❑ Yes ❑ No
7. CERCLA or State-Mandated clean up → Please submit the Record of Decision or other documentation to assist others in the evaluation for proper disposal.
8. NRC or state regulated radioactive or NORM Waste → Please identify Isotopes and pCi/g: ______________

ATTACHMENT 7

State Environmental Policy Act (SEPA) Checklist

Environmental checklist.
WAC 197-11-960

Purpose of checklist:

The State Environmental Policy Act (SEPA), chapter 43.21C RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the agency identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Governmental agencies use this checklist to determine whether the environmental impacts of your proposal are significant, requiring preparation of an EIS. Answer the questions briefly, with the most precise information known, or give the best description you can.

You must answer each question accurately and carefully, to the best of your knowledge. In most cases, you should be able to answer the questions from your own observations or project plans without the need to hire experts. If you really do not know the answer, or if a question does not apply to your proposal, write "do not know" or "does not apply." Complete answers to the questions now may avoid unnecessary delays later.

Some questions ask about governmental regulations, such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the governmental agencies can assist you.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Use of checklist for nonproject proposals:

Complete this checklist for nonproject proposals, even though questions may be answered "does not apply." IN ADDITION, complete the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D).

For nonproject actions, the references in the checklist to the words "project," "applicant," and "property or site" should be read as "proposal," "proposer," and "affected geographic area," respectively.

ENVIRONMENTAL CHECKLIST

A. BACKGROUND

1. Name of proposed project, if applicable:

   Former Aladdin Plating Site

2. Name of applicant:

   Washington State Department of Ecology

3. Address and phone number of applicant and contact person:

   Mohsen Kourehdar
   Washington State Department of Ecology
   Toxics Cleanup Program
   300 Desmond Drive
   Lacey, Washington 98504
   360.407.6256

4. Date checklist prepared:

   December 10, 2014

5. Agency requesting checklist:

   Washington State Department of Ecology

6. Proposed timing or schedule (including phasing, if applicable):

   Spring, 2015

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

   No.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

   GeoEngineers, Inc., Final Remedial Investigation/Feasibility Study Report (RI/FS), Former Aladdin Plating Site, Tacoma, Washington. GEI File No 0504-095-00. December 9, 2014.

   GeoEngineers, Inc., Final Cleanup Action Plan (CAP), Former Aladdin Plating Site, Tacoma, Washington. GEI File No 0504-095-00. December 10, 2014.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

   No.

10. List any government approvals or permits that will be needed for your proposal, if known.

    Chapter 90.48 RCW (State Water Pollution Control Act) and Chapter 173-220 WAC (National Pollutant Discharge Elimination System [NPDES] Permit Program Regulations.

    Chapter 70.105D RCW (Model Toxics Control Act) and Chapter 173-340 WAC (MTCA Regulations)

    Chapter 70.105 RCW (Washington State Hazardous Waste Management Act) and Chapter 173-303 WAC (State Dangerous Waste Regulations).

    Chapter 173-160 RCW (Minimum Standards for Construction and Maintenance of Wells).

Chapter 43.21C RCW (State Environmental Policy Act) and Chapter 197-11WAC (State Environmental Policy Act Rules).

Washington Industrial Safety and Health Act (WISHA).

Applicable Pierce County Codes.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

Based on the comparative analysis performed in the Feasibility Study, the proposed Site cleanup is soil excavation to achieve cleanup goals at the Site. Briefly, the cleanup includes:

- Excavation and off-site, permitted disposal of approximately 400 cubic yards of metals-contaminated soil that is a source of metals contamination in groundwater. Soil with metals concentrations exceeding MTCA Method A and B cleanup levels protective of direct human contact and MTCA Method B cleanup levels for soil protective of groundwater as drinking water would be removed.
- Installation of monitoring wells to monitor the natural attenuation of groundwater for at least four semi-annual monitoring events (2 years).

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

The former Aladdin Plating site is located at 1657 Center Street in Tacoma, Washington, a corner parcel located at the northeast corner of the intersection of Center Street and South Alaska Street (Figure 2). The Site is situated within the southwest quarter of Section 8, Township 20N, Range 3E, and at latitude 47 14’02.80”, longitude -122 27’27.74”. See Attachment 1, Figures 1 and 2 for a vicinity map and site plan.

B. ENVIRONMENTAL ELEMENTS

1. EARTH

a. General description of the site (circle one):

<u>Flat</u>

b. What is the steepest slope on the site (approximate percent slope)?

Approximately 0%

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

The Site is underlain by a combination of fill and native soil. Soil across the property was generally characterized as brown silty sand to sand with silt, with varying gravel content. No definitive geologic contact was identified delineating fill material from native soils.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

No.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.

See Section A 11. Depth of excavation will extend as deep as 16 feet below ground surface (bgs) as feasible (in the areas of SB-4). Other areas of excavation will range between 5 feet bgs and 11 feet bgs, with the majority of excavation across the site from the surface to 2.5 feet bgs. The excavation will be backfilled to grade with clean imported fill.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

No.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

0% (None currently planned.)

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Not applicable.

2. AIR

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.

Dust during construction, none thereafter.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

Not applicable.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

Not applicable.

3. WATER

a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

No, not applicable.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

Not applicable.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

Not applicable.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

No.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

No.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

No.

b. Ground:

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.

No.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

Not applicable.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

The current use of the Site is an unimproved lot. At completion, the Site use will remain the same, but potentially be available for redevelopment. Currently stormwater enters and leaves the Site by sheet flow. No new stormwater management facilities will be constructed as part of the cleanup action. During soil excavation, silt fences, catch basin blocks, and other materials such as straw bales will be employed as needed. A Construction Stormwater Pollution Prevention Plan will be prepared by the contractor and approved by Ecology before excavation begins.

2) Could waste materials enter ground or surface waters? If so, generally describe.

No.

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

All work will be conducted within timing windows of minimal precipitation when possible. An emergency spill kit will be located on the Site and promptly employed for the cleanup of accidental spills. Also, silt curtains and containment bails will be deployed during excavation activities as needed.

4. PLANTS

a. Check or circle types of vegetation found on the site:

__x__ deciduous tree: alder, maple, aspen, other

______ evergreen tree: fir, cedar, pine, other

______ shrubs

__x__ grass

______ pasture

______ crop or grain

______ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other

______ water plants: water lily, eelgrass, milfoil, other

______ other types of vegetation

b. What kind and amount of vegetation will be removed or altered?

Vegetation on site (volunteer alder, grasses, and brush) will be removed entirely.

c. List threatened or endangered species known to be on or near the site.

None known.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

None.

5. ANIMALS

a. Circle any birds and animals which have been observed on or near the site or are known to be on or near the site:

birds: hawk, heron, eagle, songbirds, other:

mammals: deer, bear, elk, beaver, other:

fish: bass, salmon, trout, herring, shellfish, other:

b. List any threatened or endangered species known to be on or near the site.

None known.

c. Is the site part of a migration route? If so, explain.

Unknown.

d. Proposed measures to preserve or enhance wildlife, if any:

None.

6. ENERGY AND NATURAL RESOURCES

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Not applicable.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No. Not applicable.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

Not applicable.

7. ENVIRONMENTAL HEALTH

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

The purpose of the project is to remove and reduce exposure to metals to acceptable levels. No exposure to environmental health hazards is expected.

1) Describe special emergency services that might be required.

There are no unusual risks associated with this proposal. All personnel will be required to read and abide by the Site Safety Plan. Emergency medical contact numbers and directions to the nearest hospital will be listed in the plan and posted at the Site during construction activities.

2) Proposed measures to reduce or control environmental health hazards, if any:

The purpose of the project is to remove and reduce exposure to metals to acceptable levels. The Site Safety Plan will list requirements for worker protection during excavation and removal of contaminated soil.

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

Traffic, operations at nearby manufacturing facilities.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Operation of heavy equipment, traffic from trucking. Hours of construction and trucking activity would be limited to approximately 7 AM to 3 PM weekdays.

3) Proposed measures to reduce or control noise impacts, if any:

None.

8. LAND AND SHORELINE USE

a. What is the current use of the site and adjacent properties?

The property is currently unimproved, but lies within a neighborhood zoned as light industrial. The immediate area surrounding the Site is primarily industrial with some residential housing. Each of the properties directly adjacent to the Site are zoned either light or heavy industrial by the City of Tacoma.

b. Has the site been used for agriculture? If so, describe.

No.

c. Describe any structures on the site.

None.

d. Will any structures be demolished? If so, what?

No.

e. What is the current zoning classification of the site?

Light industrial.

f. What is the current comprehensive plan designation of the site?

The current comprehensive plan designation is M-1, Light Industrial by the City of Tacoma. This zoning allows for mixed-use, including the following: commercial businesses, parks, daycare centers, warehouses, vehicle service, and wholesale in addition to other permitted site uses (Title 13-Land Use Regulatory Code).

g. If applicable, what is the current shoreline master program designation of the site?

Not applicable.

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

No.

i. Approximately how many people would reside or work in the completed project?

None in the immediate future. Undetermined for potential future use.

j. Approximately how many people would the completed project displace?

None.

k. Proposed measures to avoid or reduce displacement impacts, if any:

Not applicable.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

There will be no change to the current land use.

9. HOUSING

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

Not applicable.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

None.

c. Proposed measures to reduce or control housing impacts, if any:

Not applicable.

10. AESTHETICS

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

Not applicable. None currently planned.

b. What views in the immediate vicinity would be altered or obstructed?

Not applicable.

c. Proposed measures to reduce or control aesthetic impacts, if any:

None.

11. LIGHT AND GLARE

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

None.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

Not applicable to current planned use.

c. What existing off-site sources of light or glare may affect your proposal?

None.

d. Proposed measures to reduce or control light and glare impacts, if any:

None. Not applicable.

12. RECREATION

a. What designated and informal recreational opportunities are in the immediate vicinity?

None.

b. Would the proposed project displace any existing recreational uses? If so, describe.

No.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

None.

13. HISTORIC AND CULTURAL PRESERVATION

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.

No.

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.

None. Not applicable.

c. Proposed measures to reduce or control impacts, if any:

None.

14. TRANSPORTATION

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

Center Street
South Alaska Street
Access would remain unchanged from adjacency to these streets.

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

Yes, the nearest transit stop is approximately 200 feet east on Center Street.

c. How many parking spaces would the completed project have? How many would the project eliminate?

No spaces planned.
No spaces eliminated.

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).

No.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

No.

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

None currently planned. Not applicable.

g. Proposed measures to reduce or control transportation impacts, if any:

None.

15. PUBLIC SERVICES

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

No.

b. Proposed measures to reduce or control direct impacts on public services, if any.

None.

16. UTILITIES

a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.

None.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

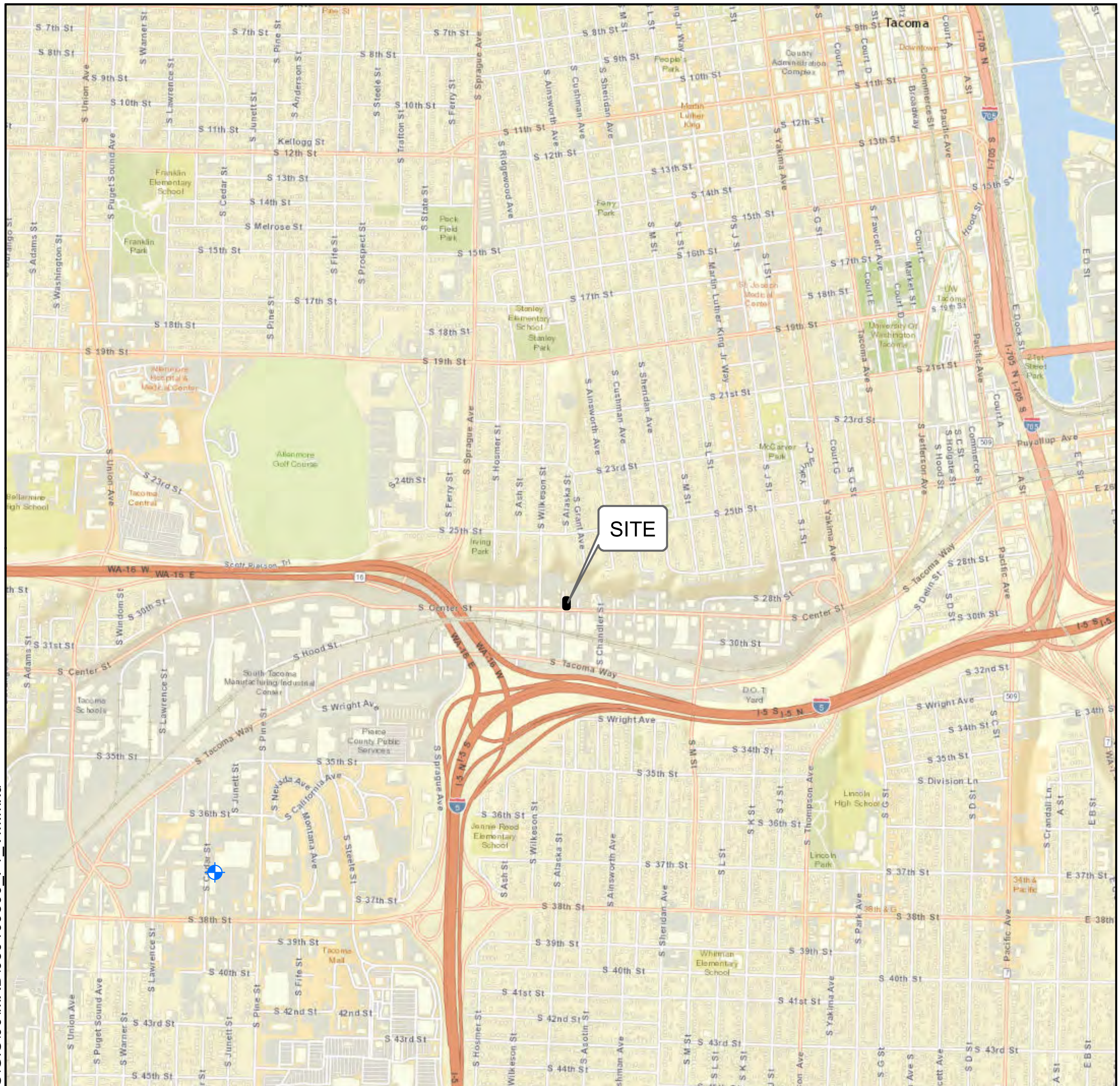
None currently planned.

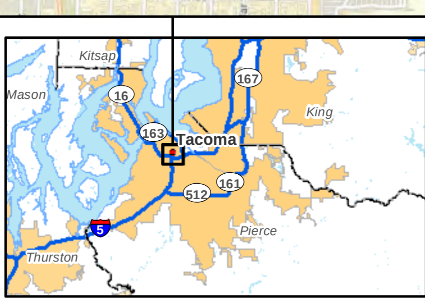
C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: ____________________

Date Submitted: December 17, 2014





City of Tacoma production well

N
W
E
S

2,000 0 2,000

Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
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Data Sources: ESRI Data & Maps, Street Maps 2005
Base map from ESRI Data Online.
Transverse Mercator, Zone 10 N North, North American Datum 1983
North arrow oriented to grid north

Vicinity Map

Former Aladdin Plating Facility
Tacoma, Washington

GeoEngineers

Figure 1

Path: \\pdx\Projects\0\0504095_GIS\GIS\00\MXD\0504095_F1_VM.mxd

Office: PORT

Property Boundary

Parcel Boundary (Pierce County)

N
W E
S

100 0 100

Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Data Sources: Parcel Boundary and roads from Pierce County GIS.
Base map from ESRI Data Online.
Transverse Mercator, Zone 10 N North, North American Datum 1983
North arrow oriented to grid north

Site Map

Former Aladdin Plating Facility
Tacoma, Washington

GEOENGINEERS

Figure 2

Office: PORT Path: P:\0\0504095_GIS\GIS\00\MXD\050409500_F2_SM.mxd Map Revised: 08 January 2014 ccabrera

ATTACHMENT 8
Bid Form

BID FORM WITH BIDDER'S BREAKDOWN OF TOTAL BID AMOUNT

Aladdin Plating Site Remediation Project

Tacoma, Washington

The following breakdown of the Total Bid Amount is required. The price breakdown shall be fairly apportioned to the various parts of the Work and shall meet with the Washington State Department of Ecology's approval. At the Washington State Department of Ecology's request, the Successful Bidder shall substantiate any price or prices with an additional detailed price breakdown or other requested information. In the event of discrepancy between the written Total Bid Amount stated in the preceding Total Bid Amount and the arithmetic total of the components herein set forth, the preceding Total Bid Amount stated in writing shall have precedence. Bid prices shall include all overhead, profit, handling and all other related charges. The estimated quantities on this Bid Form are based on available information and may vary from the actual site conditions. The actual quantities may be higher or lower than the estimated quantities provided herein. No adjustment of Bid prices will be allowed for any Bid Item due to any change in quantities.

Item No.	Spec. Section	Bid Item Description	Estimated Quantity	Unit	Unit Price / Lump Sum Amount		Total Bid	
					Numerals	Words	Dollars	Cents
1	9.0	Site Access, Temporary Site Controls, Mobilzation, and Security	1	LS				
2	10.1	Erosion Control/Stormwater Pollution Prevention	1	LS				
3	10.2	Stockpiled Materials Management Areas	1	LS				
4	10.3	Water Management System Mobilization/Demobilization	1	LS				
5	10.3	Water Management, Collection, Treatment, and Disposal Operation	21	Day				
6	11.2	Site Clearing and Grubbing	1	LS				
7	11.3	Monitoring Well Decommissioning	1	LS				
8	12.1	Remedial Excavation and Stockpiling	680	Ton				
9	12.1	Temporary Excavation Shoring	1	LS				
10	12.3	Import and Placement of Backfill and Compaction - Bank Run	800	Ton				
11	13.0	Material Management, Loading, Transport, Disposal, or Recycling - Landclearing Debris Disposal	1	Ton				
12	13.0	Material Management, Loading, Transport, Disposal, or Recycling - Subtitle D Landfill Disposal	510	Ton				
14	13.0	Material Management, Loading, Transport, Disposal, or Recycling - Subtitel C Landfill Disposal	170	Ton				
15	14.1	Groundwater Monitoring Well Installation	1	LS				
16	14.2	Fencing Restoration	1	LS				
17	14.3	Demobilization and Cleanup	1	LS				
18		Non-Scheduled Contract Items	1	LS				
			Subtotal Bid Amount					
			WA State Sales Tax (9.5%)					
			Total Bid Amount					

In Words: ____________________

Bidding Contractor: ____________________ Date: __________

Authorized Representative

____

Printed Name and Title

____

Contractor Address

____

Phone Number

Notes:
LS = Lump Sum
Ton = 2,000 pounds

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